

Thunder Bay Laboratory

1994/1995

Performance Report

**Thunder Bay Laboratory
Ministry of the Environment and Energy
Northern Ontario Region
421 James Street, South
Thunder Bay, ON
P7E 2V6
General Inquiries: (807)475-1205**

TD
380
T86
1995
MOE

**NOR015.96
May 14, 1996**

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact ServiceOntario Publications at copyright@ontario.ca

SUMMARY

The Ontario Ministry of Environment and Energy Thunder Bay Laboratory provides analytical support for environmental programs in the Northern Ontario Region. The laboratory performs chemical and microbiological analyses on a wide range of sample types.

The laboratory strives to maintain a high standard of analytical performance through its quality assurance (QA) program, of which quality control (QC) is an important component. The purpose of this report is to summarize the QC data for parameters routinely analyzed in water samples at the Thunder Bay Laboratory. It summarizes types of controls used for a test, the frequency of the controls, and the actual results of controls for 1994 and 1995. The report is intended as a source of information for the laboratory community and for clients interested in the QC program at the laboratory.

Further information regarding this report can be obtained by contacting the laboratory at:

Ministry of Environment and Energy
Thunder Bay Laboratory
421 James St. S.
Thunder Bay Ontario
P7E 2V6

General Inquiries: (807)475-1275
LIMS Assistance: (807)475-1770

Fax: (807)475-1756

E-mail using MOEE or EPO access: LIMSTBAY
E-mail using INTERNET access: LIMSTBAY @ EPO.GOV.ON.CA

ACKNOWLEDGEMENTS

The hard work and commitment to quality of all the Thunder Bay Laboratory staff is gratefully acknowledged.

TABLE OF CONTENTS

1.0 INTRODUCTION

- 1.1 Quality Control
- 1.2 Accreditation and Certification

2.0 DEFINITIONS

3.0 MICROBIOLOGY PERFORMANCE SUMMARIES

- 3.1 Quality Control Program
- 3.2 Microbiology Performance Summaries

Enumeration of Bacteria by Membrane Filtration

Escherichia coli

Fecal Coliforms

Fecal Streptococcus

Heterotrophs

Pseudomonas aeruginosa

Total Coliforms

Presence-Absence Test

4.0 WATER QUALITY PERFORMANCE SUMMARIES

Alkalinity, Conductivity, pH

Alkalinity

Conductivity

pH

Biochemical Oxygen Demand

Chemical Oxygen Demand

Chloride

Colour - True

Conductivity Meter

Fluoride

Iron - Colourimetric

pH - BOD

Silicon-Molybdate Reactive Silicates

Solids

Total

Suspended

Dissolved

4.0 WATER QUALITY PERFORMANCE SUMMARIES (CONT'D)

- Soluble Nutrients
 - Ammonia
 - Nitrite
 - Nitrate and Nitrite
 - Nitrate
 - Phosphate
- Sulphate
- Total Nutrients
 - Total Kjeldahl Nitrogen
 - Total Phosphorus
- Turbidity

5.0 METALS PERFORMANCE SUMMARIES

- Boron
- Hydrides
 - Antimony
 - Arsenic
 - Selenium
- Major Cations
 - Calcium
 - Magnesium
 - Potassium
 - Sodium
- Mercury
- Metals By Preconcentration
 - Aluminum
 - Barium
 - Beryllium
 - Cadmium
 - Chromium
 - Cobalt
 - Copper
 - Iron
 - Lead
 - Manganese
 - Molybdenum
 - Nickel
 - Silver
 - Strontium
 - Titanium
 - Vanadium
 - Yttrium
 - Zinc

5.0 METALS PERFORMANCE SUMMARIES (CONT'D)

Metals Without Preconcentration

Aluminum
Barium
Beryllium
Cadmium
Chromium
Cobalt
Copper
Iron
Lead
Manganese
Molybdenum
Nickel
Strontium
Titanium
Vanadium
Yttrium
Zinc

1.0 INTRODUCTION

1.1 Quality Control

The purpose of quality control samples is to demonstrate to the operator and data user that the analytical system is in control, and that the data is not affected by the analytical system itself. By monitoring these standards over the long-term, limits of effective performance can be established. By visualizing the performance of the instrument against these limits graphically, deviations from past performance can be easily identified and corrected before data quality is affected.

In addition to using in-house quality control standards, the Thunder Bay Laboratory uses external reference materials, wherever possible, to confirm accuracy and performance of the system. Sources of external reference materials include the National Institute of Standards and Technology (NIST), the National Research Council (NRC) and commercially prepared standard reference materials.

The Thunder Bay Laboratory also actively participates in interlaboratory studies. Interlaboratory studies in which the laboratory regularly participates are described below. Results of interlaboratory studies can be obtained by contacting the laboratory.

LRTAP	Long Range Transport of Air Pollutants; Environment Canada; three times per year.
CAEAL	Canadian Association for Environmental Analytical Laboratories; performance evaluation samples, twice per year.
GLAP	Great Lakes Action Plan; Environment Canada; twice per year.
MOEE	Ontario Ministry of Environment and Energy; performance audit samples are sent by the Quality Management Office routinely; special interlaboratory studies are periodically set-up; also referred to as "QM Blind Audits" through-out the report.
MOH	Ontario Ministry of Health; bacteriological samples, twice per year.

1.2 Accreditation and Certification

The laboratory is accredited by the Standards Council of Canada (SCC), as administered by the Canadian Association for Environmental Analytical Laboratories (CAEAL/ACLAE Inc.). In order to obtain accreditation by SCC, member laboratories must undergo an on-site inspection once every two years by CAEAL assessors, and obtain a score ≥ 70 on performance evaluation (PE) samples twice per year, where PE samples are available. Listed below are parameters which are currently accredited by SCC.

Acidity	Strontium
Alkalinity	Titanium
Alkalinity (pH 3.8)	Vanadium
Gran Alkalinity	Yttrium
Low Level Alkalinity (pH 4.5)	Zinc
Total Alkalinity (pH 4.5)	Microbiology
Ammonia	Aeromonas
BOD	Clostridium perfringens
Chloride	Escherichia coli
COD	Fecal Coliforms
Colour (True)	Fecal Streptococci
Conductivity	Heterotrophic Bacteria
Fluoride	Pseudomonas aeruginosa
Hardness	Staphylococcus aureus
Hydride Metals	Total Coliforms
Antimony	Nitrate
Arsenic	Nitrate + Nitrite
Selenium	Orthophosphate
Iron (Colourimetric)	pH
Mercury	Silica
Metals (total and dissolved)	Soft Metals
Aluminum	Calcium
Barium	Magnesium
Beryllium	Potassium
Boron	Sodium
Cadmium	Solids
Chromium	Dissolved Solids
Cobalt	Suspended Ignition Solids
Copper	Total Ignition Solids
Iron	Total Solids
Lead	Total Suspended Solids
Manganese	Sulphate
Molybdenum	Total Phosphorus
Nickel	Total Kjeldahl Nitrogen
Silver	Turbidity

2.0 DEFINITIONS

Each QC report consists of a summary of the test, tabulated data, and a graph which summarizes the performance of the test. Although the same general format is used throughout the report, there may be slight differences in the format, reflecting the differences in the type of testing. Listed below is a glossary of terms which will aid in the interpretation of the summaries. A separate section on quality controls used in microbiology is included in the appropriate section.

Analytical Procedure:	Description of the analytical test procedure and instrumentation.
Blank:	Sample prepared in the same manner as field samples, but in which the analyte is known to be absent. Tests for background levels of the analyte in the analytical system.
Calibration:	The determination of the relationship between analyte concentration and instrument response.
Calibration Check Solution:	Standards prepared separately from the calibration solutions to ensure proper operation of the instrument and verify the current calibration. Also used as a in-run check to determine calibration drift during analysis.
Control Chart:	Relates ongoing analytical performance to control limits.
Control Limits:	Limits defined statistically or based on protocol requirements which, when exceeded, trigger analyst intervention. Control limits are calculated using the within-run standard deviation (S_w) of historical data.
Digested Spikes:	Blanks to which a known amount of analyte is added. These samples are taken through the analytical process to monitor analyte recovery. Comparison to control limits determined from historical data establishes the validity of the current analytical run.
Drift:	Control samples to check for drift and/or sensitivity change.
Duplicates:	Used to determine ability of the analytical system including the operator to repeat an analysis. Establishes the precision that can be expected from the analytical system. Low level duplicate data is used to statistically determine the detection limit of the system.

Interlaboratory Studies:	Studies that involve the exchange of samples amongst laboratories. The results are reported to the referee agency and compared to the median result generated by the participating laboratories. Provides a snapshot comparison to laboratories conducting similar analyses.
LIMS:	Laboratory Information Management System.
Method Number:	Quality Management Unit number assigned to the analytical method.
Method Introduced:	Date method was implemented at laboratory.
Product:	Analyses or services that are distinguished by a unique matrix, test parameter, and method.
Reference Materials:	Purchased samples containing an known amount of analyte. The reference value is established through round-robin testing or through analysis by several independent analytical techniques. Represents an independent test of the accuracy of an analytical method.
Reporting:	Units reported to the client and/or the maximum significant figures used to report the result.
Sample Matrix:	Sample types that are routinely analyzed. The matrix is indicated by a two character alphabetic code, as outlined below:

BF - Fish	VE - Vegetation
SE - Sediment	VM - Moss Bags
SL - Sludge	WD - Drinking Water
SO - Soil	WG - Ground Water
TE - Effluent	WL - Leachate
TI - Industrial/Trade Waste	WP - Precipitation
TP - Process Water	WS - Surface Water
TR - Raw Sewage	

Standard Deviation:	An estimate of the spread of repeated measurements about their average value, obtained under specified conditions.
S_w :	Standard deviation based on within-lab repeatability data which is used in setting warning and control limits. The period of time or number of data points used to calculate S_w is parameter dependent.

<T:

A low-level data qualifier used to indicate that the measured value is a trace amount. Data qualified with <T should be interpreted with caution.

<W:

A low-level data qualifier which indicates that no measureable responses were observed under the test conditions. The numerical value indicates the smallest amount that could have been measured under routine conditions. W is derived from the standard deviation of duplicates near zero.

3.0 MICROBIOLOGY

3.1 QUALITY CONTROL PROGRAM

In this report, data is presented which summarizes quality control (Q.C.) procedures used in the membrane filtration test and Presence-Absence test. These QC procedures are used to ensure that an analytical test is working properly and that reported results are accurate and reproducible within the limits of normal statistical variation.

MEMBRANE FILTRATION TEST (MF)

Blank Control Filters

Each sample analyzed by the membrane filter test is separated from the previous sample by introducing a control filter at the beginning of each analysis. The control filter is employed in the same manner as those filters used for sample analyses, however, only sterile buffered rinse water is filtered. The control filter is placed on m Endo-LES medium. If there is only one target growing on the control filter and/or a few background colonies, the control filter is considered positive for growth but the next sample result is not deemed to be compromised. However, if excessive contamination is suspected, the next result will not be reported and, if possible, the analyses will be repeated. As well, the result immediately preceeding the control filter is in question, as the bacteria were likely carried over from this sample.

Duplicate Analysis

Duplicate analysis is conducted on $\geq 5\%$ of the samples. The data are accumulated for each parameter and differences in duplicate results are sorted according to ranges of colony counts per filter. A mean and within-run standard deviation are calculated; the standard deviation gives a measure of the repeatability of results.

The mean difference within each range is multiplied by 3.267 to give a precision criteria (PRC) or control limit for a particular range. Graphs for each range of colony counts per filter show how results compare to the calculated control limit, which is based on the previous 12 months of data. Where excessive bias is suspected, corrective action is taken.

Media Quality Control

The pH of a medium is monitored after sterilization has taken place. The final pH may vary within specified limits from the recommended value. The medium is checked for sterility by incubating random samples of plates at room temperature. Any bacterial growth will require retesting of the medium for sterility. Confirmation of contamination will result in the rejection of the medium. The batch or lot number of a medium is recorded to determine if any changes in quality occur when batch or lot numbers change.

Selective agar media used in the detection and enumeration of indicator bacteria are tested to ensure their proper functioning. A quantitative QC test of agar media for membrane filter tests involves filtering dilute suspensions of positive and negative cultures, or environmental samples, in duplicate. The duplicate filters are placed, respectively, on agar plates from the new and previous batches of media. If the new batch of medium meets the past performance of the previous batch of medium, the number of colonies on the respective plates should be approximately the same. Medium is retested or rejected if it fails to meet the past performance of the previous medium. In this report, only those results for a target colony or an environmental sample are tabulated. Results are recorded and statistically analyzed as for duplicate analysis. Also, to ensure a selective medium is allowing for the growth of target organisms, pure cultures are filtered in duplicate and respective filters are placed on selective and non-selective media. The culture should form approximately the same number of colonies on the selective and non-selective plates. Media is retested or rejected if it appears the selective medium is over-inhibitory. Again, the data is recorded and statistically analyzed as for duplicate analysis. Not all of these Q.C. tests are performed on every batch of medium, and actual Q.C. tests performed may vary from parameter to parameter.

PRESENCE-ABSENCE (P-A) TESTS

Blank Control P-A Bottles

Every 20 samples, a blank control is prepared by pouring 100 mL of sterile distilled water into a P-A bottle and incubating it along with the regular P-A bottles. The P-A blank bottle is incubated for four days and should remain free of any bacterial growth or colour change. Isolation of indicator organisms in more than one P-A blank control test will require rechecking the sterility of the dilution blanks, the P-A medium and the procedure.

Media Quality Control

A number of checks are performed on the P-A broth including: pH, sterility at 20°C and 35°C and growth reaction of Escherichia coli, a fecal streptococcus and Salmonella typhimurium. If the medium is functioning properly, E. coli will produce a strong acid reaction (yellow colour in the medium) and gas reaction. The fecal streptococcus will produce an acid reaction only and S. typhimurium will produce heavy growth only.

3.2 Microbiology Performance Summaries

ENUMERATION OF BACTERIA BY MEMBRANE FILTRATION

IDENTIFICATION:

Method Title: Membrane Filtration Methods for the Enumeration of Total Coliforms, Fecal Coliforms, Escherichia coli, Pseudomonas aeruginosa, Fecal Streptococci and Total Aerobic Heterotrophic Bacteria.

Method Number: E6050A

Methods Introduced: 1968-1983

Current Revision: May 01, 1995

PARAMETERS:

Escherichia coli
Fecal Coliforms
Fecal Streptococci
Heterotrophic Plate Count (HPC)
Pseudomonas aeruginosa
Total Coliforms

SAMPLE MATRICES: Membrane filtration procedures are typically applied to liquid samples such as ground water, drinking water, surface water, leachates and waste water. In addition, membrane filtration procedures may be used to recover and enumerate bacteria from soil or sediments, if a measured portion of the matrix is transferred into a sterile liquid diluent. Specific matrices analyzed are: SL, TE, TI, TP, TR, WD, WG, WL, WP, WS.

ANALYTICAL PROCEDURE:

The process of membrane filtration is performed similarly for each bacterial analyte. The differences in procedure occur with regard to the culture media, incubation temperatures, and incubation periods, as outlined below:

<u>Parameter</u>	<u>Media</u>	<u>Incubation Temperature</u>	<u>Incubation Period</u>
<u>Escherichia coli</u>	mFC-BCIG	44.5 ± 0.2°C	23 ± 1 hours
Fecal Coliforms	mTEC	44.5 ± 0.2°C	23 ± 1 hours
Fecal Streptococci	mEnterococcus	35 ± 0.5°C	48 ± 3 hours
HPC	SPC	35 ± 0.5°C	48 ± 3 hours
<u>P. aeruginosa</u>	mPAE	41.5 ± 0.5°C	48 ± 3 hours
Total Coliforms	mENDO-LES	35 ± 0.5°C	22 ± 2 hours

CONTROLS AND QUALITY ASSURANCE:

Controls: Blank filter between each sample (except for HPC).

Duplicates: 1 every 20 samples.

Media QC: Media tested with environmental samples and/or positive control cultures.

Reference Materials: E. coli control culture from the USEPA (lot #121589).

Interlabs: Ontario Ministry of Health Proficiency Testing Program (total coliforms, fecal coliforms, and E. coli.)

CAEAL Performance Evaluation Program (total and fecal coliforms).

Reporting: Results are reported as colony counts/100 mL for all parameters except HPC; HPC results are reported as colony counts/mL.

Escherichia coli by Membrane Filtration

Quality Control Data from January 1 - December 31, 1994

Analytical Range - 0 to 100 Counts per Filter

Controls:

Number of Controls	Positive Controls
1749	0

Duplicates:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	119	1.8	1.4
21-80	20	4.0	2.9
81-100	0	N/A	N/A

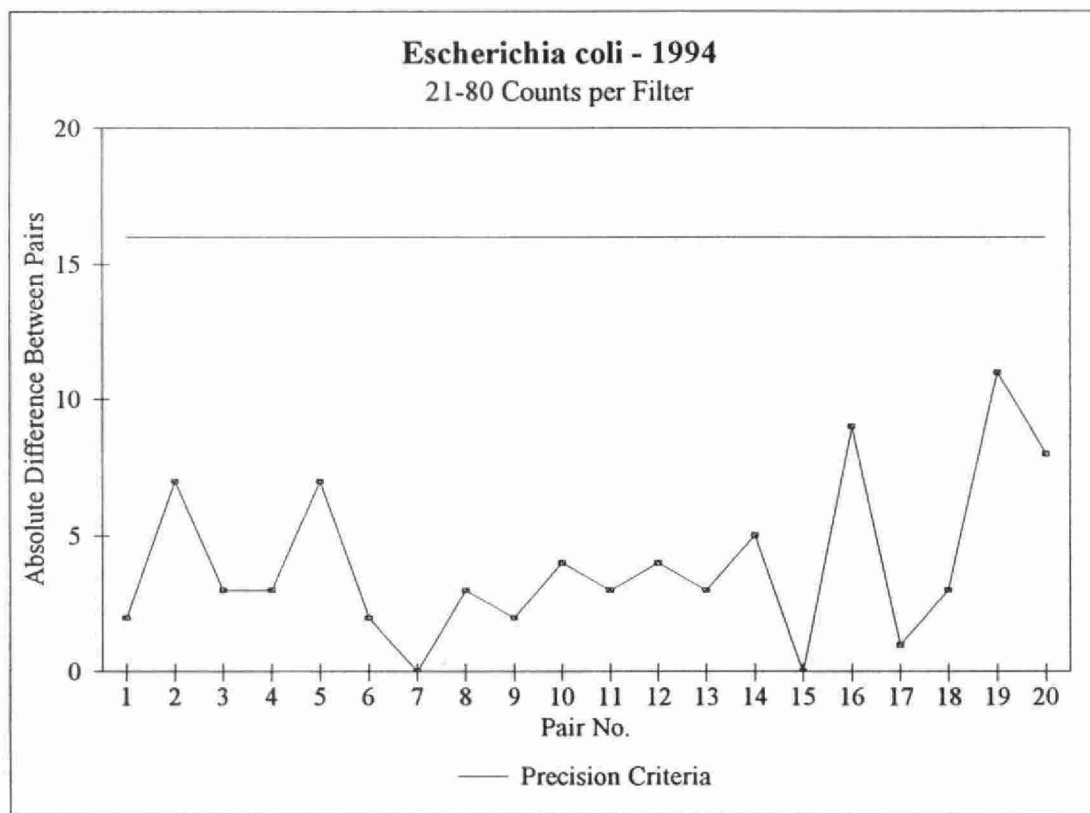
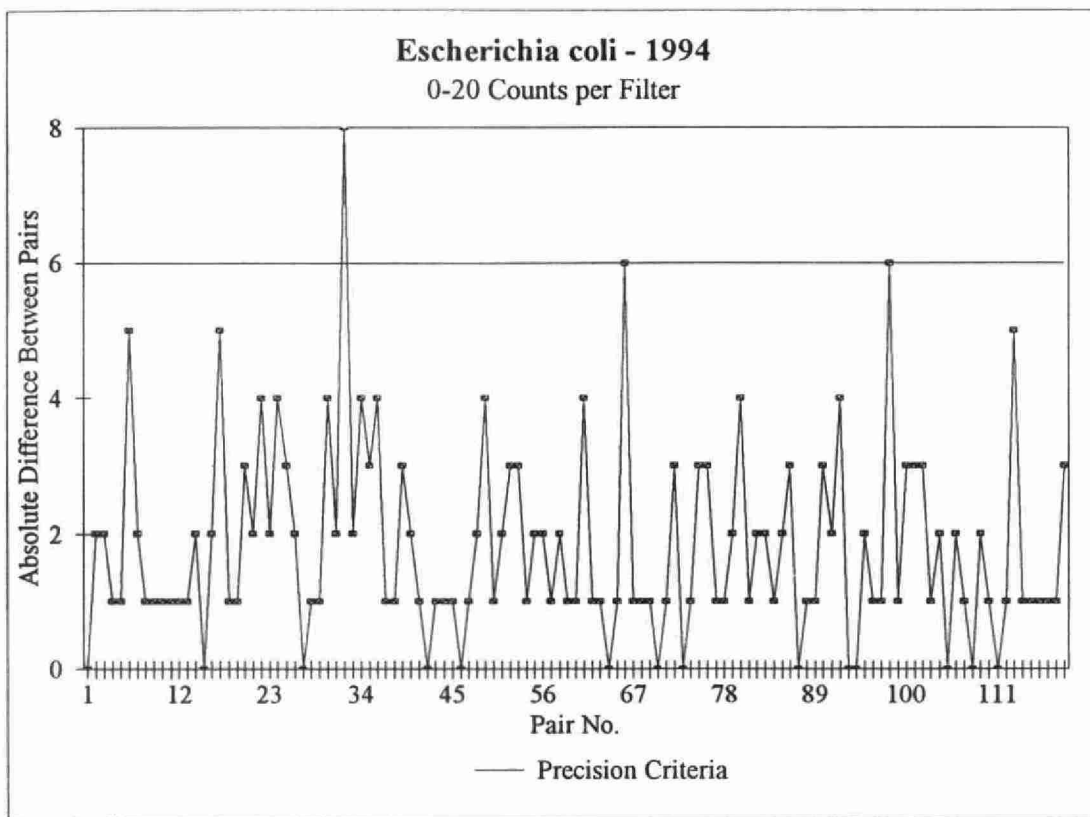
Media Quality Control:

Comparison of E. coli on Present vs. Previous Medium

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	6	2.5	2.0
21-80	9	8.2	6.6
81-100	2	5	N/A

Comparison of a Sample on Present vs. Previous Medium:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	4	5.3	4.7
21-80	10	7.9	7.6
81-100	1	N/A	N/A



Escherichia coli by Membrane Filtration

Quality Control Data from January 1 - December 31, 1995

Analytical Range - 0 to 100 Counts per Filter

Controls:

Number of Controls	Positive Controls
2557	0

Duplicates:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	147	1.6	1.5
21-80	17	4.9	3.8
81-100	0	N/A	N/A

Media Quality Control:

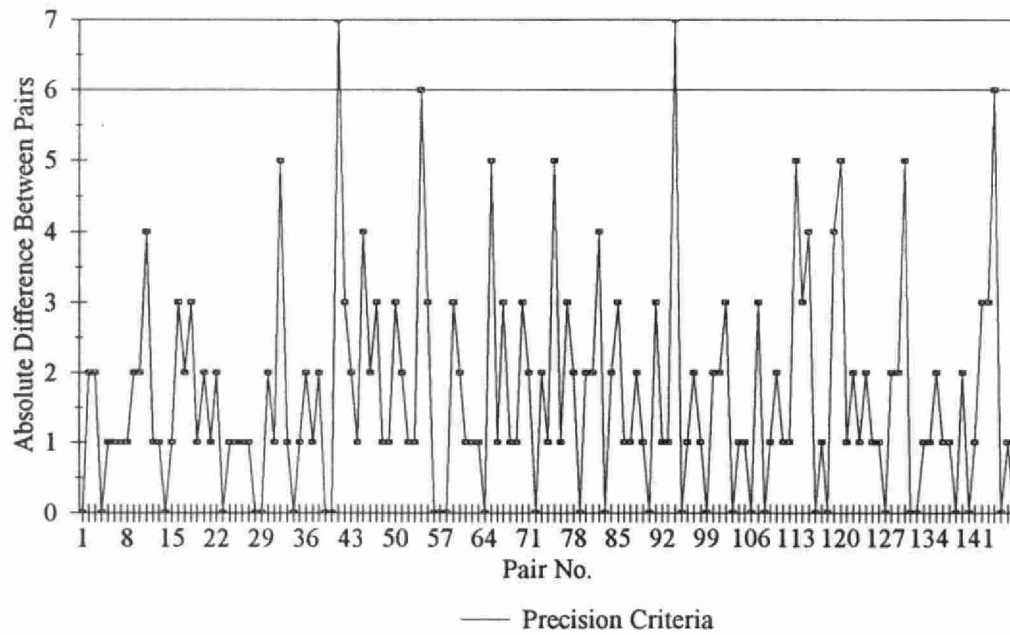
Comparison of E. coli on Present vs. Previous Medium

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	4	1.5	1.5
21-80	8	5.3	3.7
81-100	0	N/A	N/A

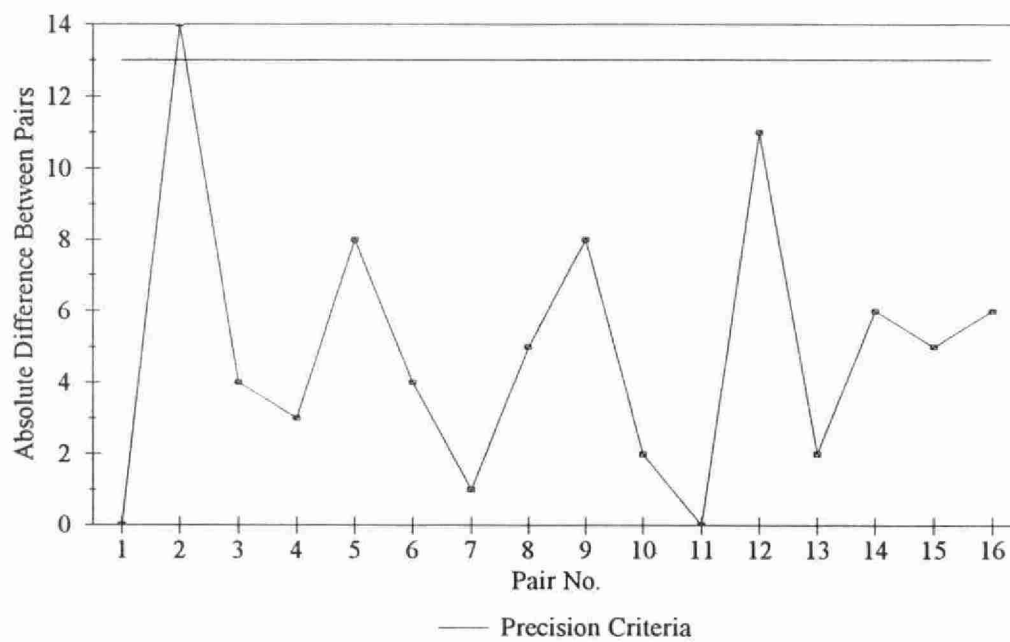
Comparison of a Sample on Present vs. Previous Medium:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	6	3.2	2.0
21-80	6	10.2	6.7
81-100	0	N/A	N/A

Escherichia coli - 1995
0-20 Counts per Filter



Escherichia coli - 1995
21-80 Counts per Filter



Fecal Coliforms by Membrane Filtration

Quality Control Data from January 1 - December 31, 1994

Analytical Range - 0 to 100 Counts per Filter

Controls:

Number of Controls	Positive Controls
1382	0

Duplicates:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	114	1.5	1.4
21-80	14	6.6	4.2
81-100	0	N/A	N/A

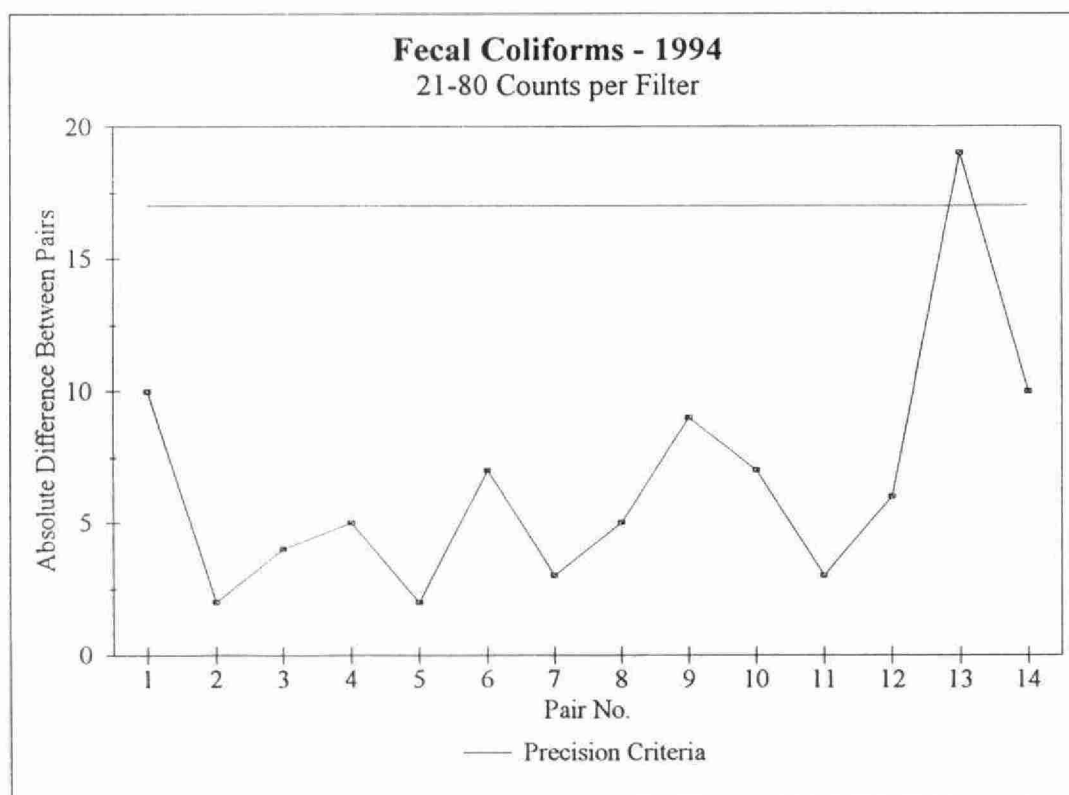
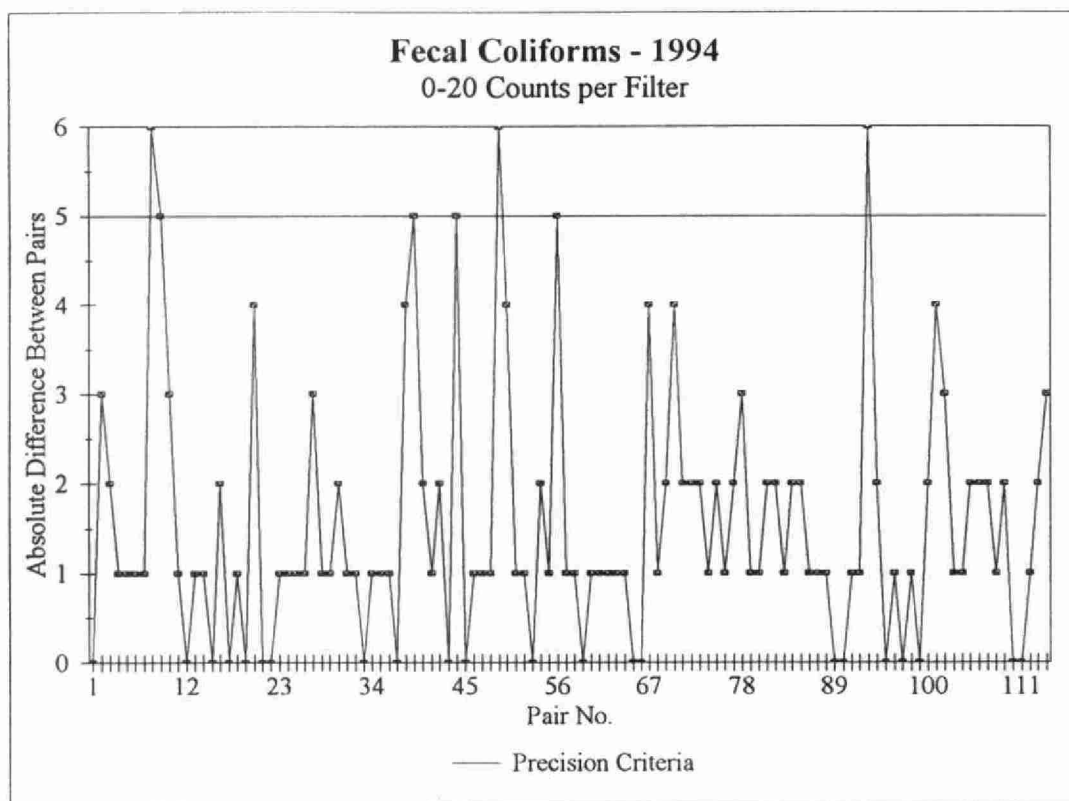
Media Quality Control:

Comparison of E. coli on mTEC Medium and a Non-Selective Medium:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	2	4.5	N/A
21-80	6	7.5	3.6
81-100	0	N/A	N/A

Comparison of a Sample on Present vs. Previous Medium:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	3	5.6	0.5
21-80	6	9.8	6.4
81-100	1	2	N/A



Fecal Coliforms by Membrane Filtration

Quality Control Data from January 1 - December 31, 1995

Analytical Range - 0 to 100 Counts per Filter

Controls:

Number of Controls	Positive Controls
147	0

Duplicates:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	5	N/A	N/A
21-80	6	N/A	N/A
81-100	0	N/A	N/A

Media Quality Control:

Comparison of E. coli on mTEC Medium and a Non-Selective Medium:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	3	3.7	3.1
21-80	2	7.5	2.5
81-100	0	N/A	N/A

Comparison of a Sample on Present vs. Previous Medium:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	2	3.0	2.0
21-80	3	4.0	0.0
81-100	1	N/A	N/A

-small data set due to phase-out of test in 1995; graphs are not available

Fecal Streptococci by Membrane Filtration

Quality Control Data from January 1 - December 31, 1994

Analytical Range - 0 to 150 Counts per Filter

Controls:

Number of Controls	Positive Controls
1604	0

Duplicates:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	166	1.6	1.3
21-80	23	4.1	2.8
81-100	0	N/A	N/A

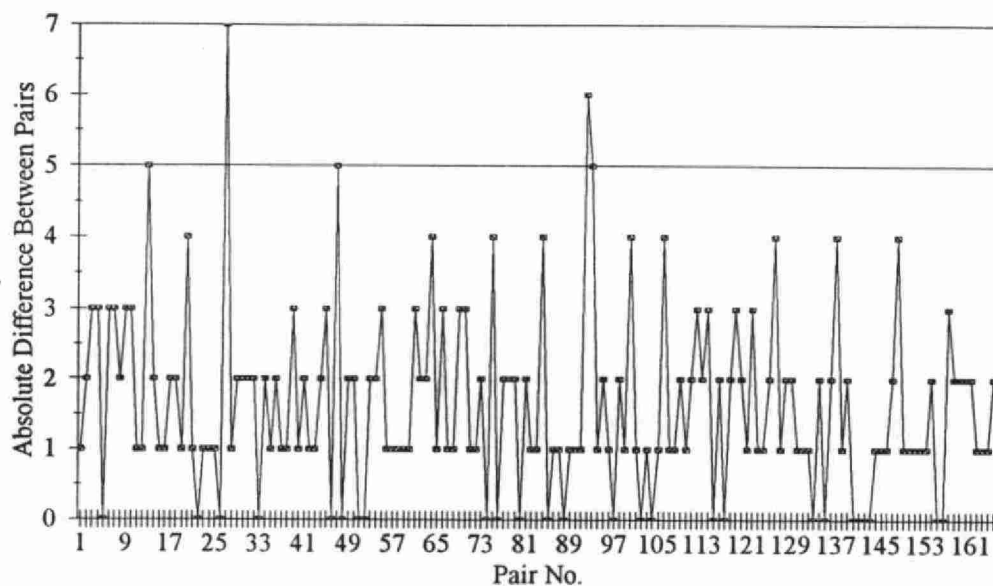
Media Quality Control:

Comparison of a Fecal Streptococcus on Present vs. Previous Medium

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	8	4.8	3.9
21-80	4	10	6.1
81-100	0	N/A	N/A

Fecal Streptococcus - 1994

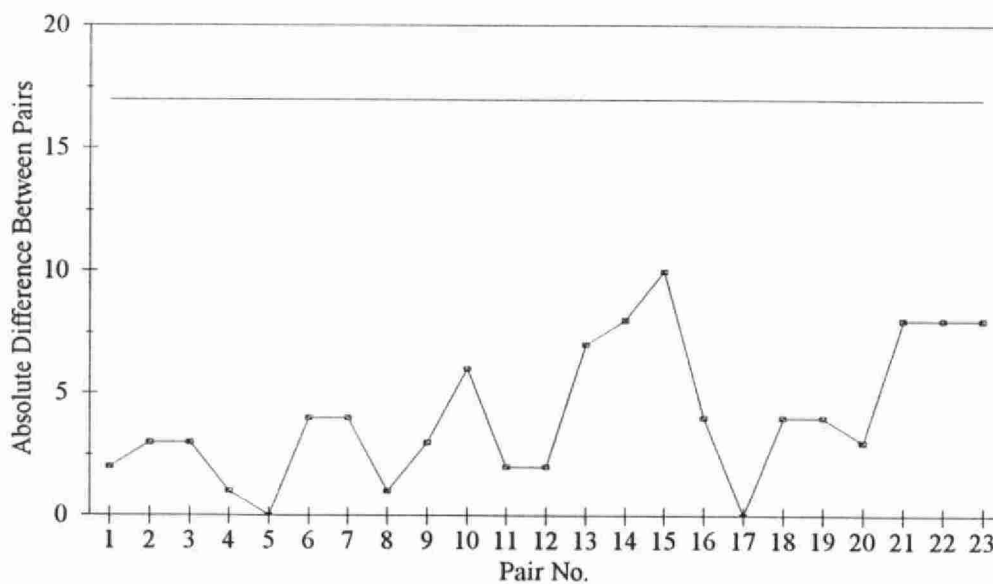
0-20 Counts per Filter



— Precision Criteria

Fecal Streptococcus - 1994

21-80 Counts per Filter



— Precision Criteria

Fecal Streptococci by Membrane Filtration

Quality Control Data from January 1 - December 31, 1995

Analytical Range - 0 to 150 Counts per Filter

Controls:

Number of Controls	Positive Controls
1786	0

Duplicates:

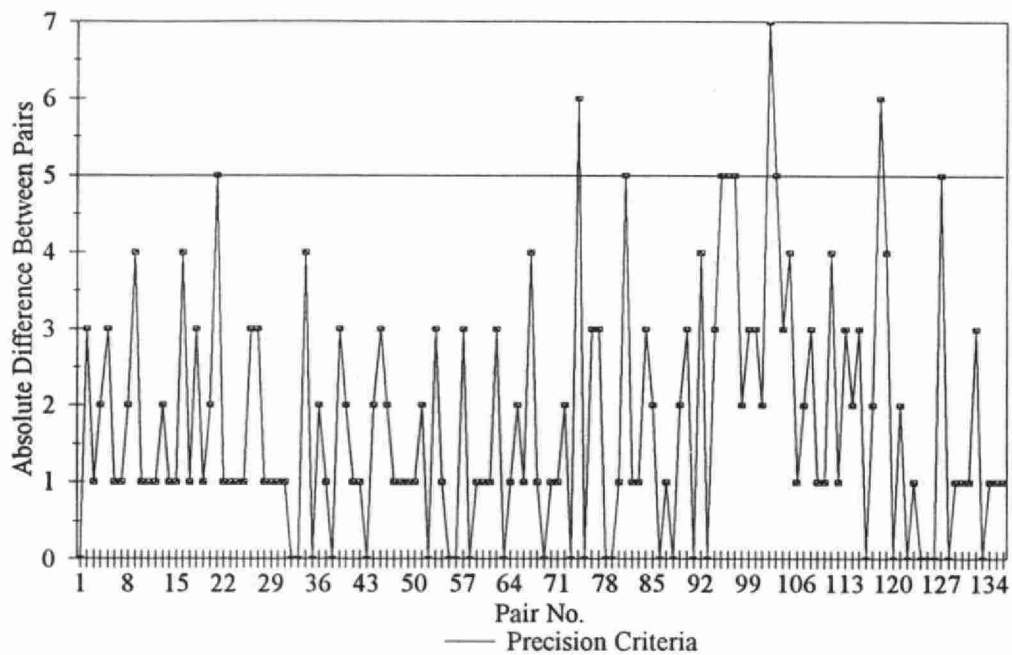
Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	136	1.8	1.6
21-80	25	5.4	3.7
81-100	0	N/A	N/A

Media Quality Control:

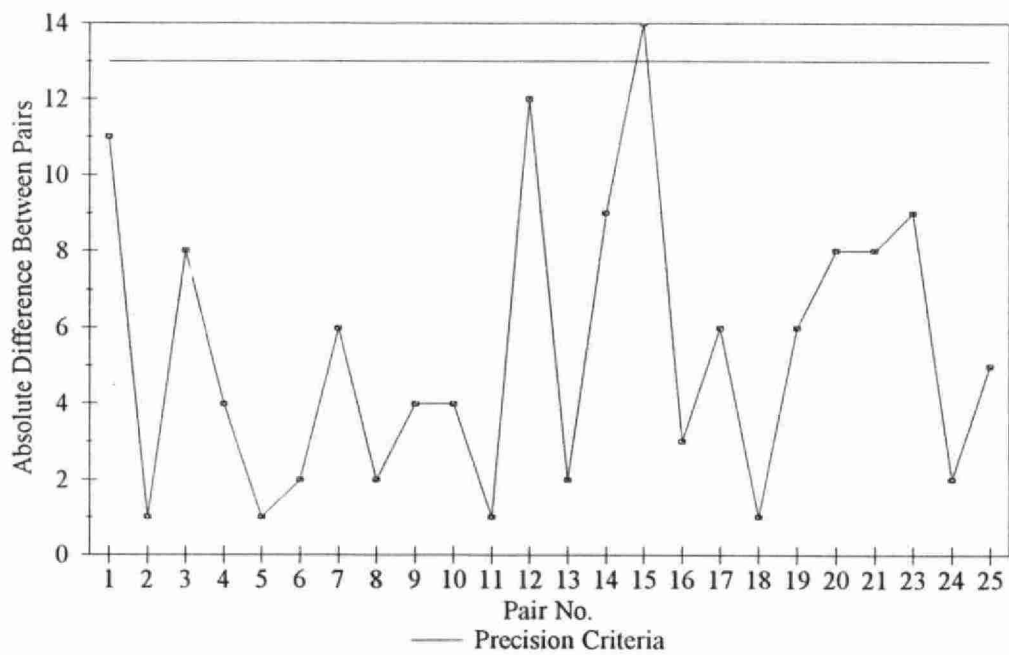
Comparison of a Fecal Streptococcus on Present vs. Previous Medium

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	10	4.2	2.8
21-80	1	N/A	N/A
81-100	0	N/A	N/A

Fecal Streptococci - 1995 0-20 Counts per Filter



Fecal Streptococci - 1995 21-80 Counts per Filter



Heterotrophic Plate Count

Quality Control Data from January 1 - December 31, 1994

Analytical Range - 0 to 1000 Counts per Filter

Duplicates:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	180	2.1	1.8
21-80	31	5.7	3.6
81-300	24	10.7	12.7

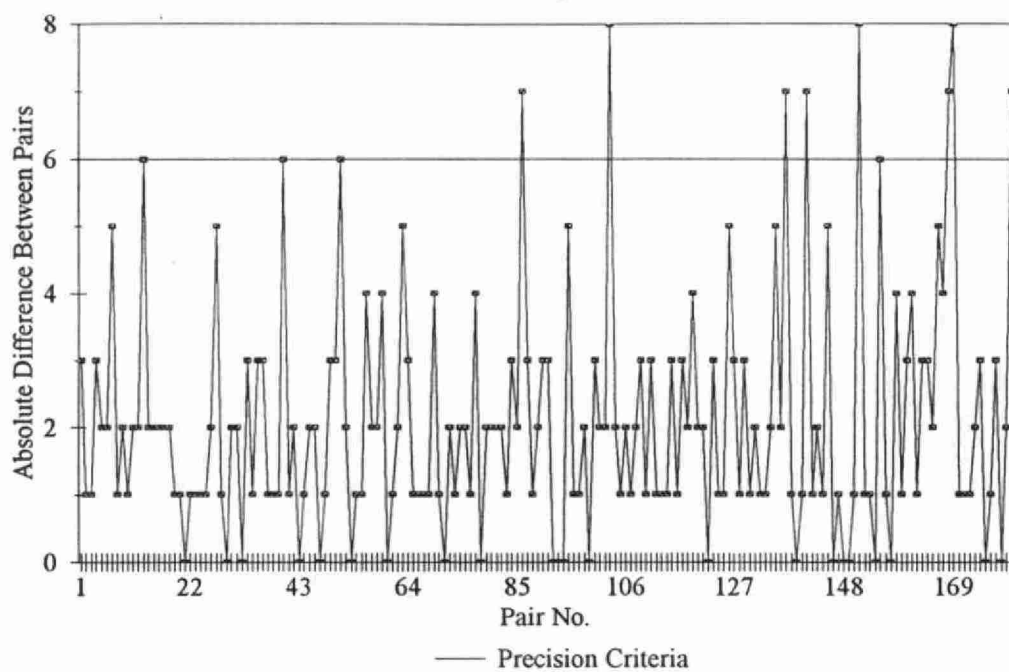
Media Quality Control:

Comparison of an E. coli on Present vs. Previous Medium

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	5	3.6	0.8
21-80	13	7.3	6.9
81-100	0	N/A	N/A

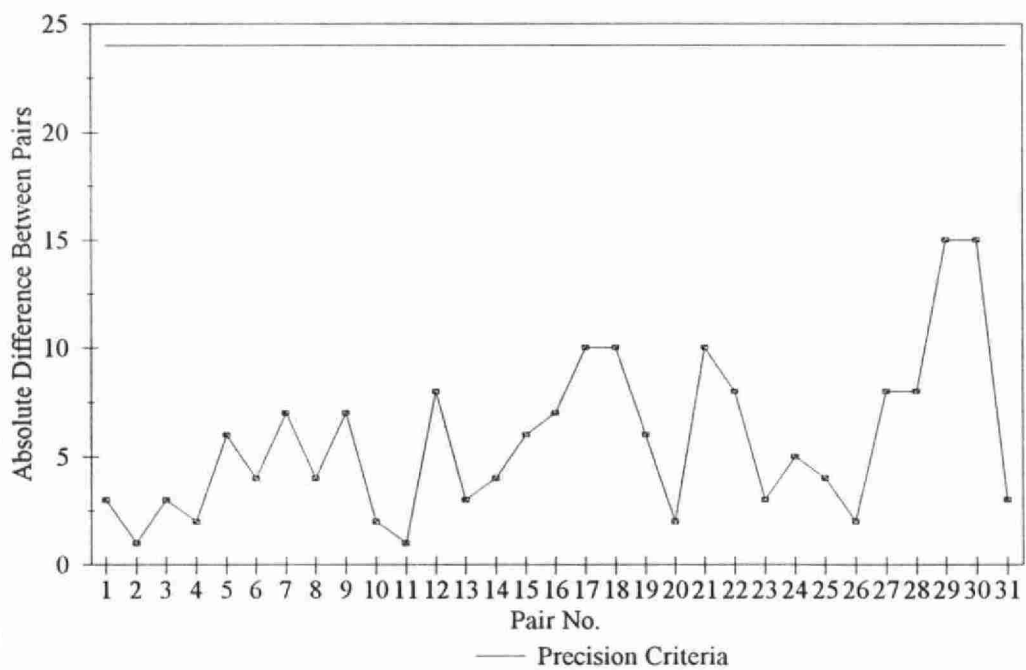
Heterotrophic Plate Count - 1994

0-20 Counts per Filter



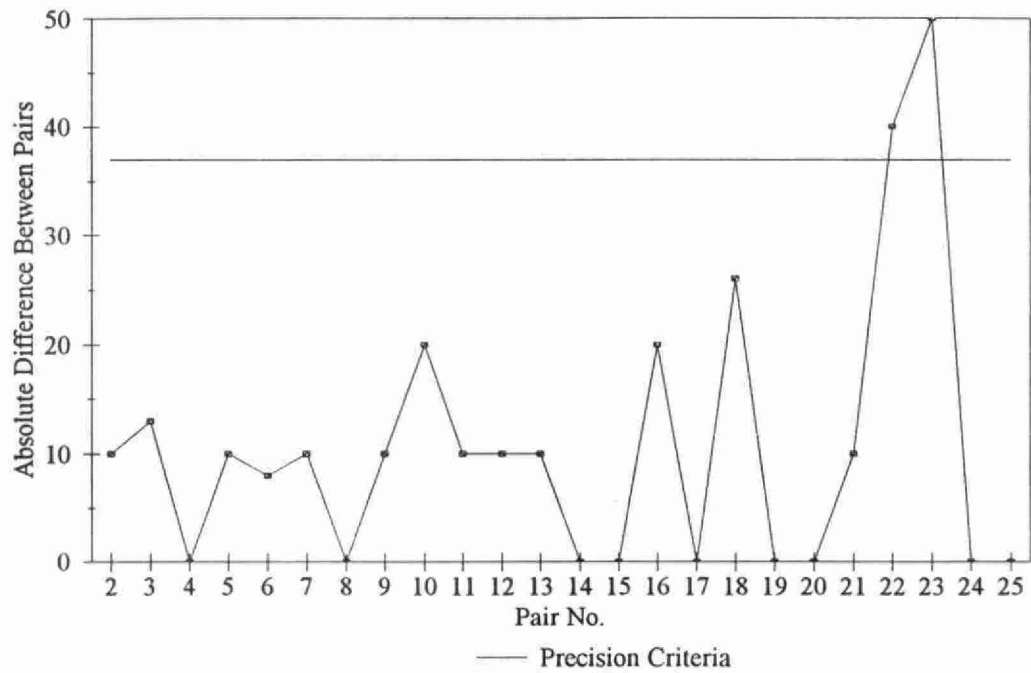
Heterotrophic Plate Count - 1994

21-80 Counts per Filter



Heterotrophic Plate Count - 1994

81-300 Counts per Filter



Heterotrophic Plate Count

Quality Control Data from January 1 - December 31, 1995

Analytical Range - 0 to 1000 Counts per Filter

Duplicates:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	179	1.9	2.0
21-80	37	6.8	4.4
81-300	9	13.7	7.6

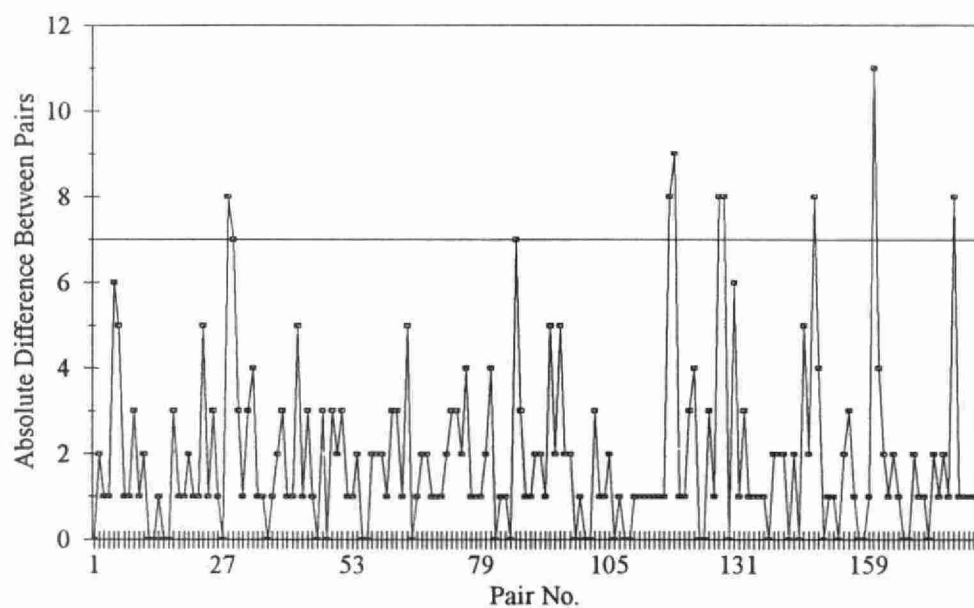
Media Quality Control:

Comparison of an E. coli on Present vs. Previous Medium

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	7	1.9	1.6
21-80	14	6.5	4.2
81-100	0	N/A	N/A

Heterotrophic Plate Count -1995

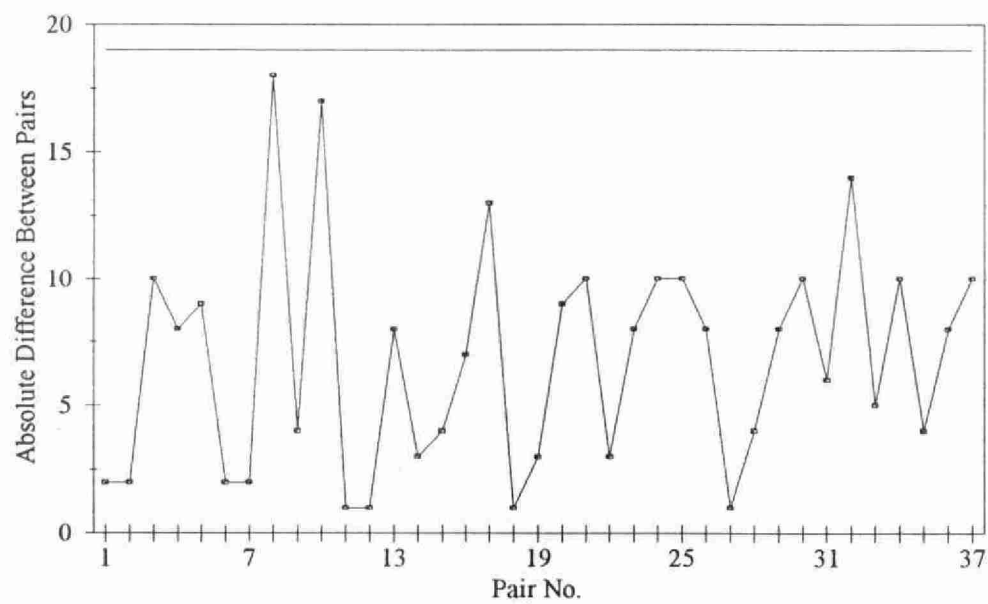
0-20 Counts per Filter



— Precision Criteria

Heterotrophic Plate Count - 1995

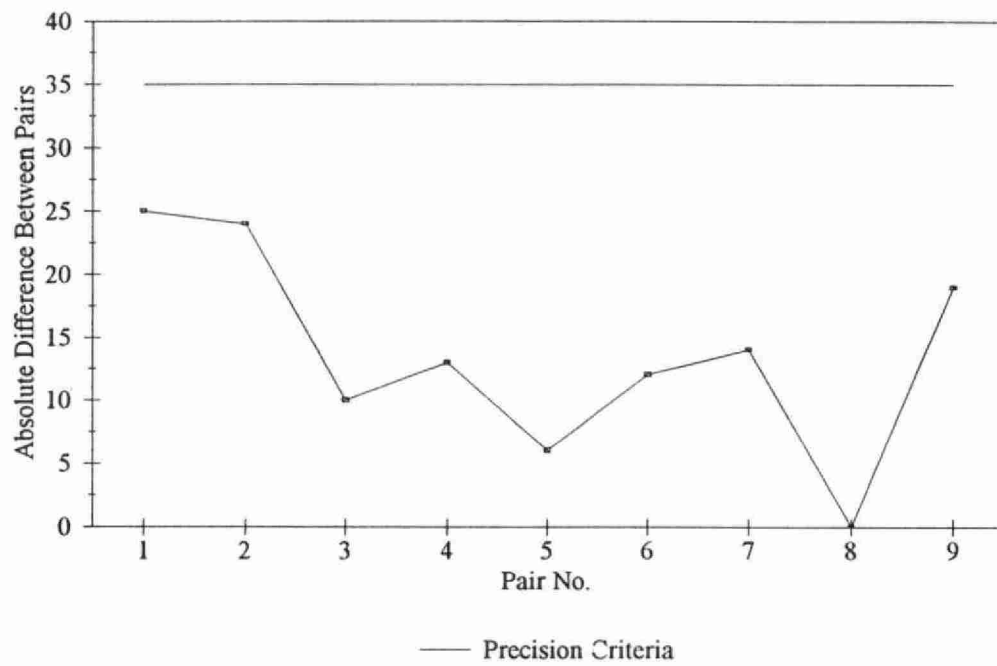
21-80 Counts per Filter



— Precision Criteria

Heterotrophic Plate Count - 1995

81-300 Counts per Filter



Pseudomonas aeruginosa by Membrane Filtration

Quality Control Data from January 1 - December 31, 1994

Analytical Range - 0 to 150 Counts per Filter

Controls:

Number of Controls	Positive Controls
463	0

Duplicates:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	47	2.3	1.9
21-80	21	6.3	3.2
81-100	0	N/A	N/A

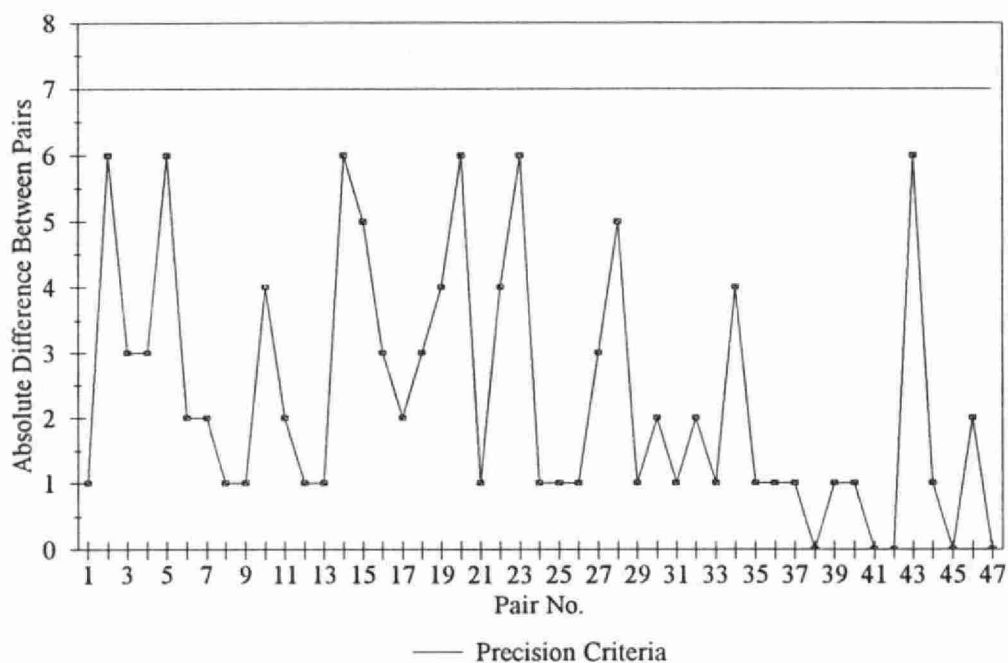
Media Quality Control:

Comparison of a *Pseudomonas aeruginosa* on Present vs. Previous Medium

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	9	3.3	2.3
21-80	3	14.3	5.6
81-100	0	N/A	N/A

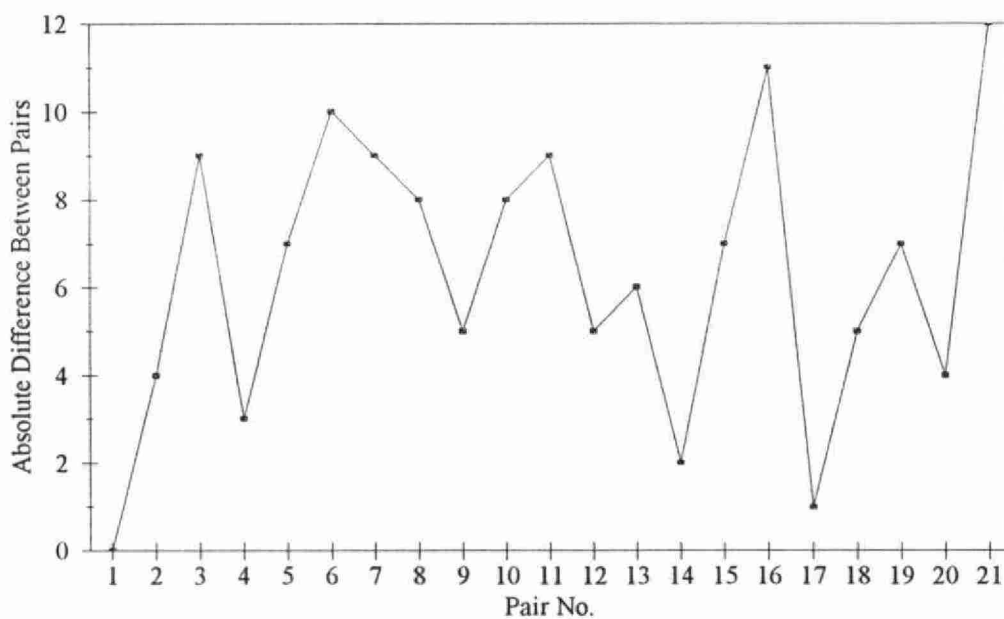
***Pseudomonas aeruginosa* - 1994**

0-20 Counts per Filter



***Pseudomonas aeruginosa* - 1994**

21-80 Counts per Filter



(limits not yet established)

Pseudomonas aeruginosa by Membrane Filtration

Quality Control Data from January 1, 1995 - December 31, 1995

Analytical Range - 0 to 150 Counts per Filter

Controls:

Number of Controls	Positive Controls
282	0

Duplicates:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	15	2.3	1.8
21-80	1	N/A	N/A
81-100	0	N/A	N/A

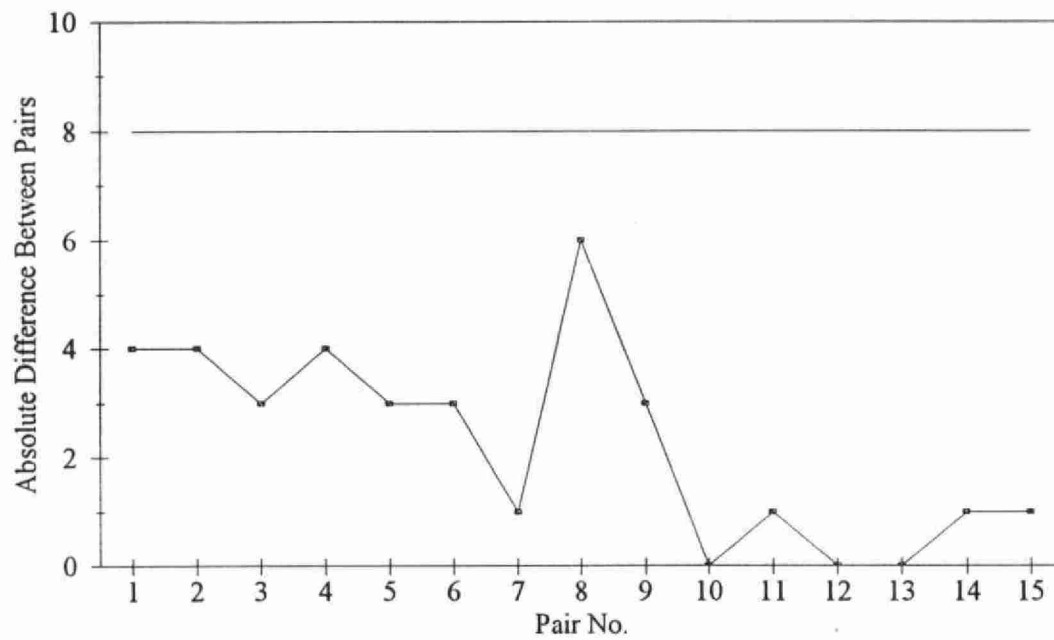
Media Quality Control:

Comparison of a *Pseudomonas aeruginosa* on Present vs. Previous Medium

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	5	4.2	3.5
21-80	5	5.0	3.7
81-100	1	N/A	N/A

***Pseudomonas aeruginosa* - 1995**

0-20 Counts per Filter



— Precision Criteria

Total Coliforms by Membrane Filtration

Quality Control Data from January 1 - December 31, 1994

Analytical Range - 0 to 150 Counts per Filter

Controls:

Number of Controls	Positive Controls
2709	2

Duplicates:

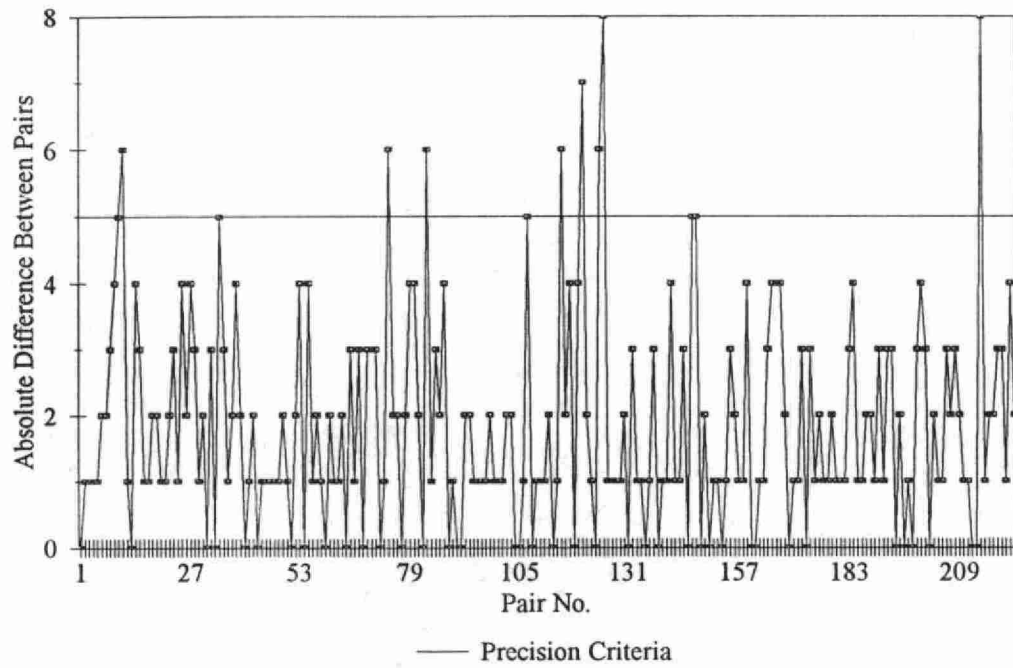
Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	222	1.8	1.6
21-80	22	5.1	5.3
81-100	13	9.2	5.1

Media Quality Control:

Batches Prepared	Batches Rejected
53	0

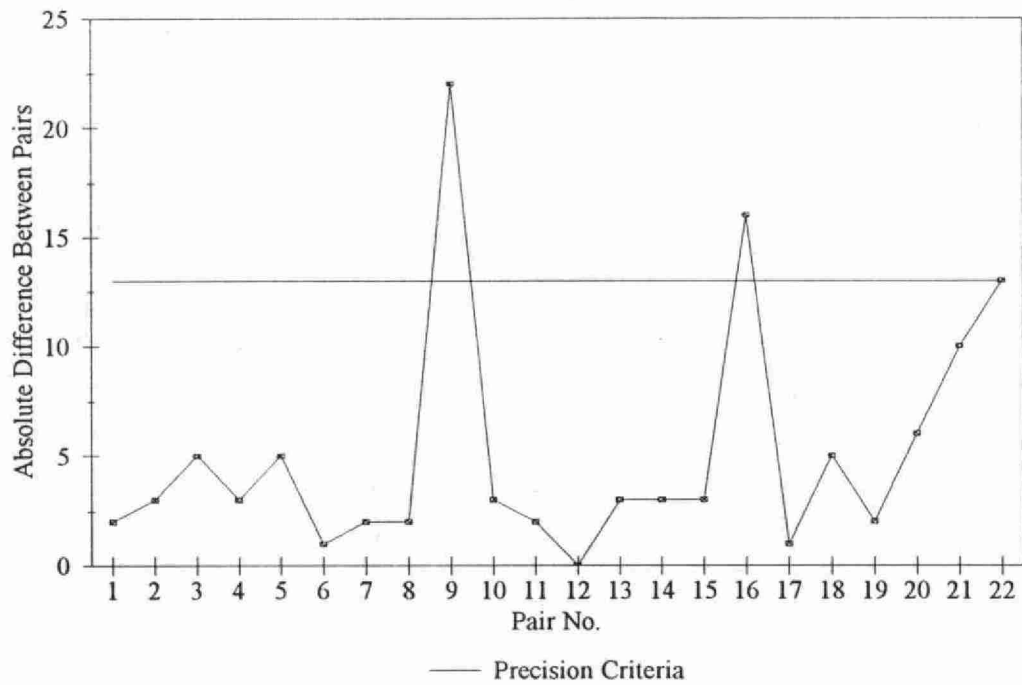
Total Coliforms - 1994

0-20 Counts per Filter

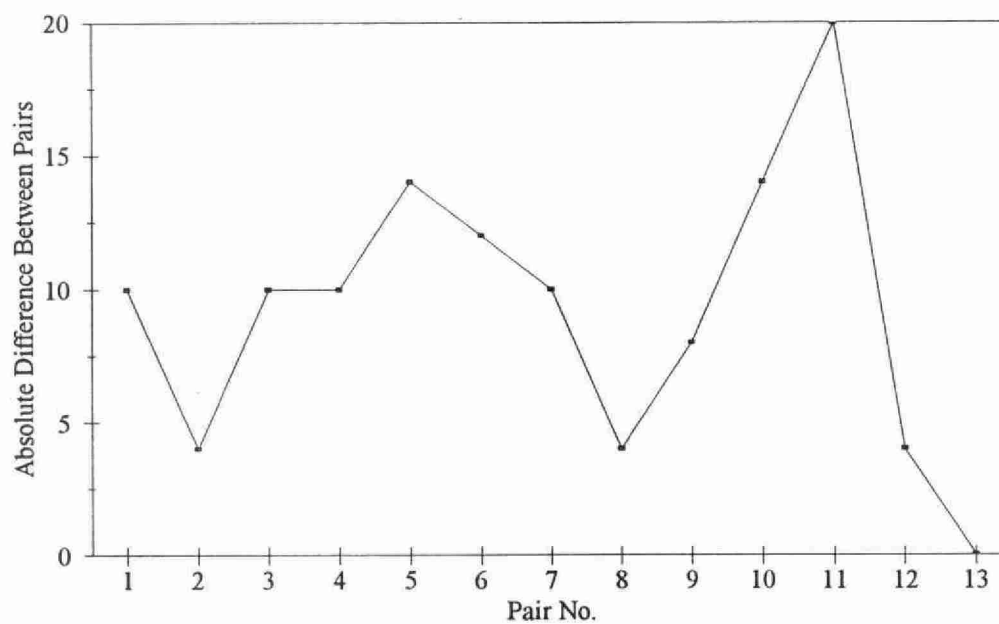


Total Coliforms - 1994

21-80 Counts per Filter



Total Coliforms - 1994
81-150 Counts per Filter



(limits not yet established)

Total Coliforms by Membrane Filtration

Quality Control Data from January 1 - December 31, 1995

Analytical Range - 0 to 150 Counts per Filter

Controls:

Number of Controls	Positive Controls
3073	4

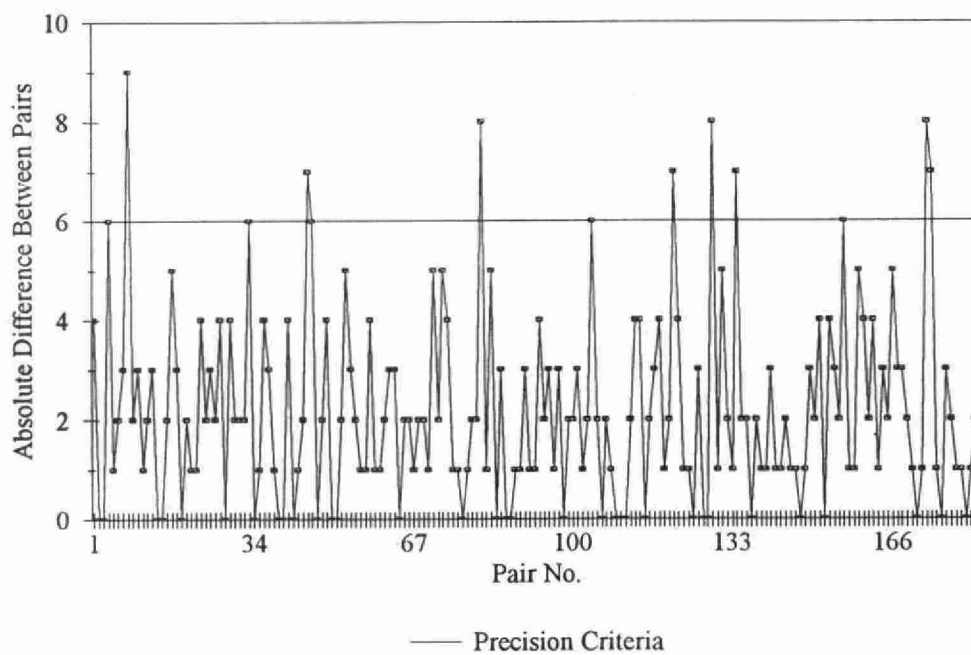
Duplicates:

Counts per filter	No. of Data Pairs	Mean Difference	Standard Deviation
0-20	184	2.2	1.9
21-80	27	5.6	4.7
81-100	2	N/A	N/A

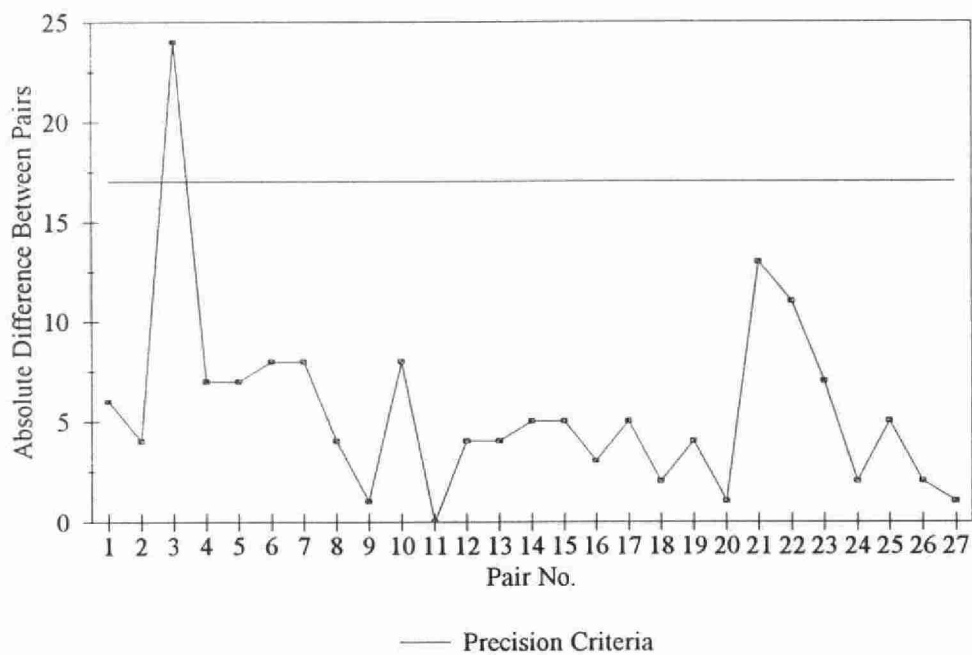
Media Quality Control:

Batches Prepared	Batches Rejected
49	0

Total Coliforms - 1995 0-20 Counts per Filter



Total Coliforms - 1995 21-80 Counts per Filter



PRESENCE-ABSENCE TEST

IDENTIFICATION:

Method Title: The Determination of Indicator Bacteria in Drinking Water by the Presence-Absence (P-A) Procedure

Method Number: E6022B

Method Introduced: 1969

Current Revision: July 6, 1995

SAMPLE MATRICES: WD, WG

ANALYTICAL PROCEDURE:

A 100 mL volume of sample is added to a presence-absence (P-A) bottle. The bottle is incubated at $35 \pm 0.5^{\circ}\text{C}$ for 4 days and examined every 24 hours for acid and/or gas formation. When a positive reaction occurs, the inoculum is transferred to confirmatory media to determine the presence of total coliforms, fecal coliforms, E. coli, Aeromonas species, fecal streptococci, Pseudomonas aeruginosa, and Staphylococcus aureus.

CONTROLS AND QUALITY ASSURANCE:

Controls: A blank control sample is included every 20 to 25 samples.

Media QC: PA broth batches are checked for sterility.

Inoculation of the medium is done with various organisms to determine its response.

Reporting: Microbiological parameters are reported as either present or absent per 100 mL of sample.

Presence-Absence Test

Quality Control Data from January 1 - December 31, 1994

Controls:

Number of Samples	Number of Controls	Controls with:	
		growth	indicator organisms
13,717	783	11	0

Media Quality Control:

Number of Batches	Batches Rejected
22	0

Presence-Absence Test

Quality Control Data from January 1 - December 31, 1995

Controls:

Number of Samples	Number of Controls	Controls with:	
		growth	indicator organisms
13,363	681	11	0

Media Quality Control:

Number of Batches	Batches Rejected
19	0

4.0 Water Quality Performance Summaries

ALKALINITY, CONDUCTIVITY AND pH

IDENTIFICATION:

Method Title: The Determination of Conductivity, pH and Alkalinity in Water and Effluents by Potentiometry.

Method Number: E6003A

Method Introduced: 1978

Current Revision: May 01, 1995

PARAMETERS:	Parameter Name	W(units)	T(units)
	Alkalinity	n/a	n/a
	Conductivity	1 μ S/cm	5 μ S/cm
	pH	n/a	n/a

SAMPLE MATRICES:

Sample matrices analyzed are surface water, drinking water, groundwater, precipitation, lechates, industrial waste and sewage effluents.

ANALYTICAL PROCEDURE:

Alkalinity: Samples are titrated with 0.02N sulphuric acid to pH <4.5. The titrant delivery rate is determined from the slope of the titration curve and the stability of the pH reading following each aliquot of titrant.

Conductivity: A conductivity cell is introduced into a sample at room temperature with continuous stirring.

pH: pH is measured directly on a stirred sample using a hydrogen ion sensitive glass combination electrode.

CONTROLS AND QUALITY ASSURANCE:

Controls: Long Term Blank
Quality Control Solutions A,B and C

Duplicates: 1 for every 15 samples

Interlabs: CAEAL Certified
Ontario Ministry of the Environment and Energy Performance Evaluation Study
LRTAP, GLAP participant

Reporting:	Alkalinity	Conductivity	pH
Maximum Significant Figures:	3	2	2
Units:	mg/L as CaCO ₃	μ S/cm	unitless

Alkalinity - PHALCO

Quality Control Data from 940101 to 941231

Analytical Range: 200.00 mg/L as CaCO₃ Detection Limit (W): n/a

Sw used to calculate control limits - Sw(A-B): 0.2530
Sw(B-C): 0.1483

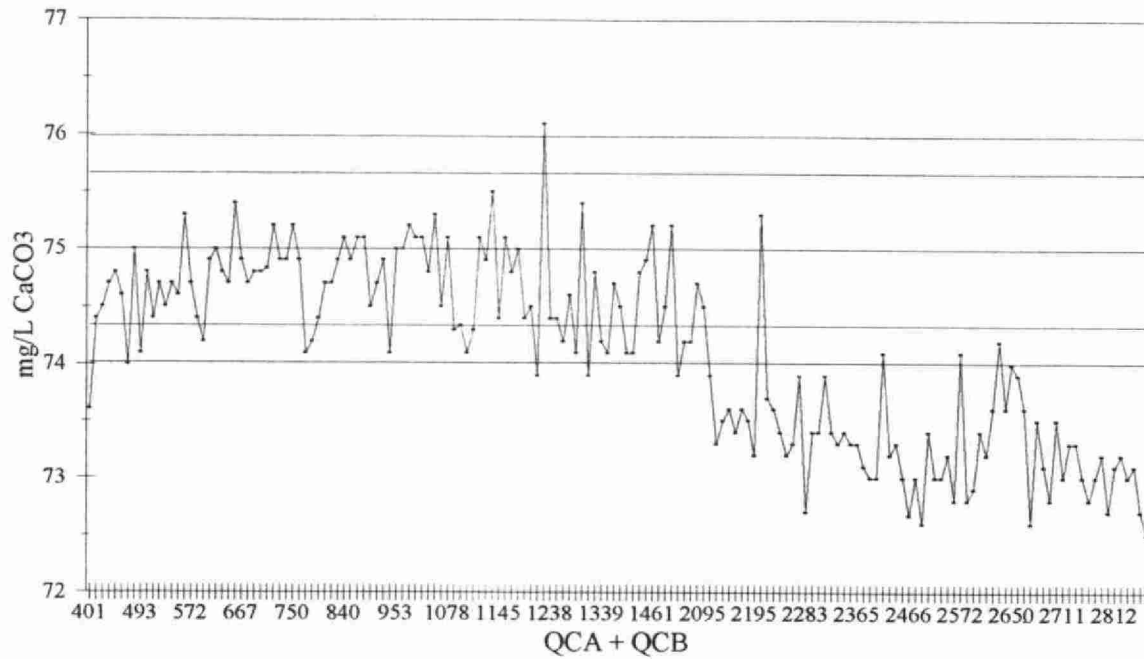
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	166	50	49.4955	-0.5045	0.5179
QCB:	166	25	24.6041	-0.3959	0.3172
QCC:	166	5	4.9999	-0.0001	0.1813
QCA+QCB:	166	75	74.0996	-0.9004	0.8078
QCA-QCB:	166	25	24.8914	-0.1086	0.2916
QCB+QCC:	166	30	29.6040	-0.3960	0.3936
QCB-QCC:	166	20	19.6042	-0.3958	0.3348

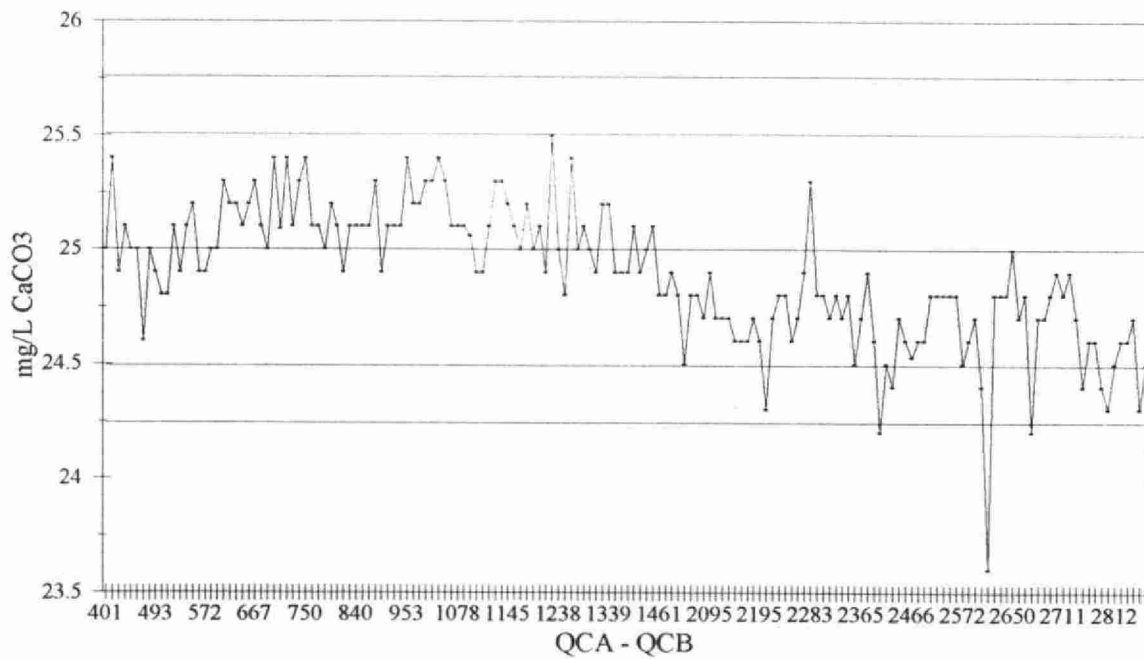
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
215	0 - 40	19.5400	0.3180
205	40 - 100	64.3540	1.5156
86	100 - 200	138.9710	1.2261

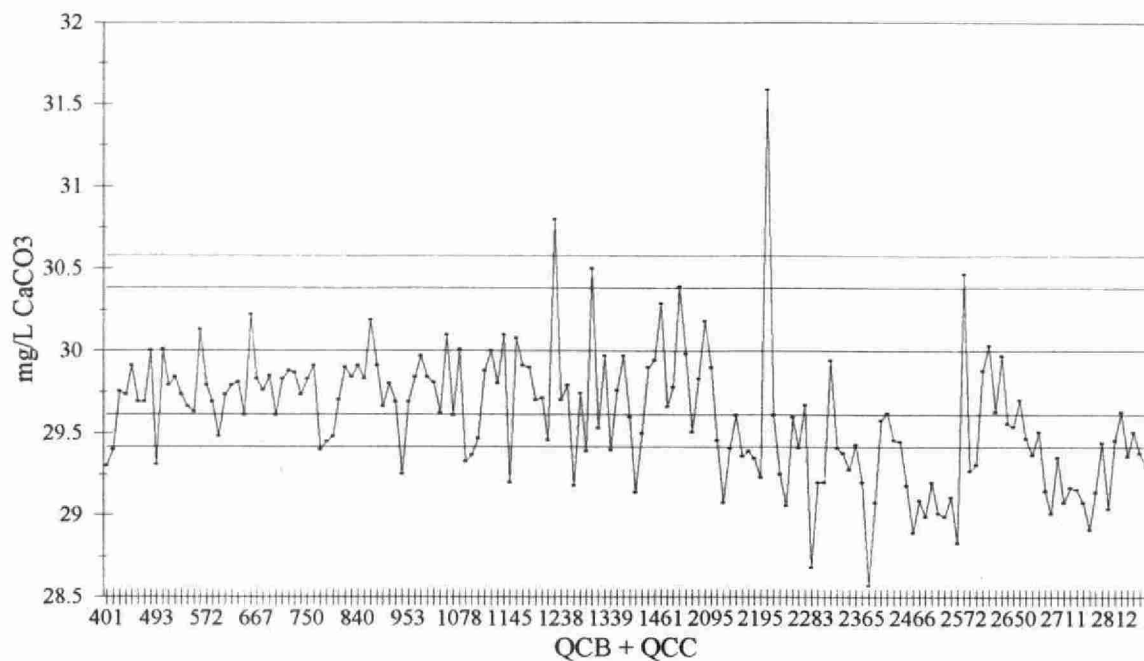
Alkalinity - PHALCO
Quality Control Data: 940101 to 941231



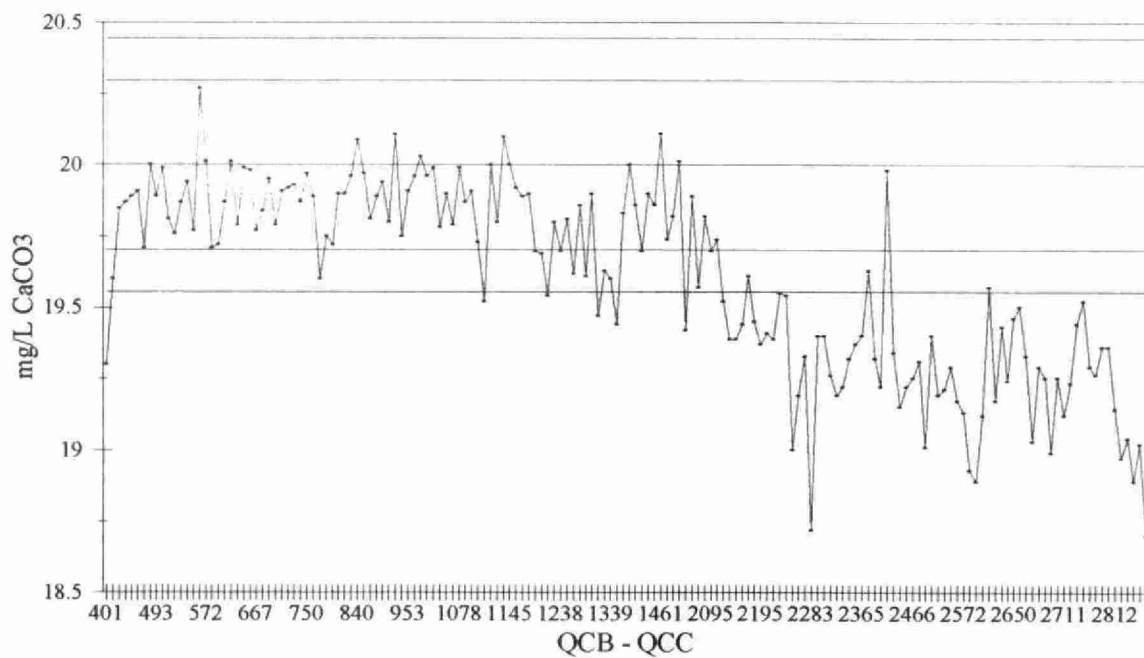
Alkalinity - PHALCO
Quality Control Data: 940101 to 941231



Alkalinity - PHALCO
Quality Control Data: 940101 to 941231



Alkalinity - PHALCO
Quality Control Data: 940101 to 941231



Alkalinity - PHALCO

Quality Control Data from 950101 to 951231

Analytical Range: 200.00 mg/L as CaCO₃ Detection Limit (W): n/a

Sw used to calculate control limits - Sw(A-B): 0.2923
Sw(B-C): 0.3350

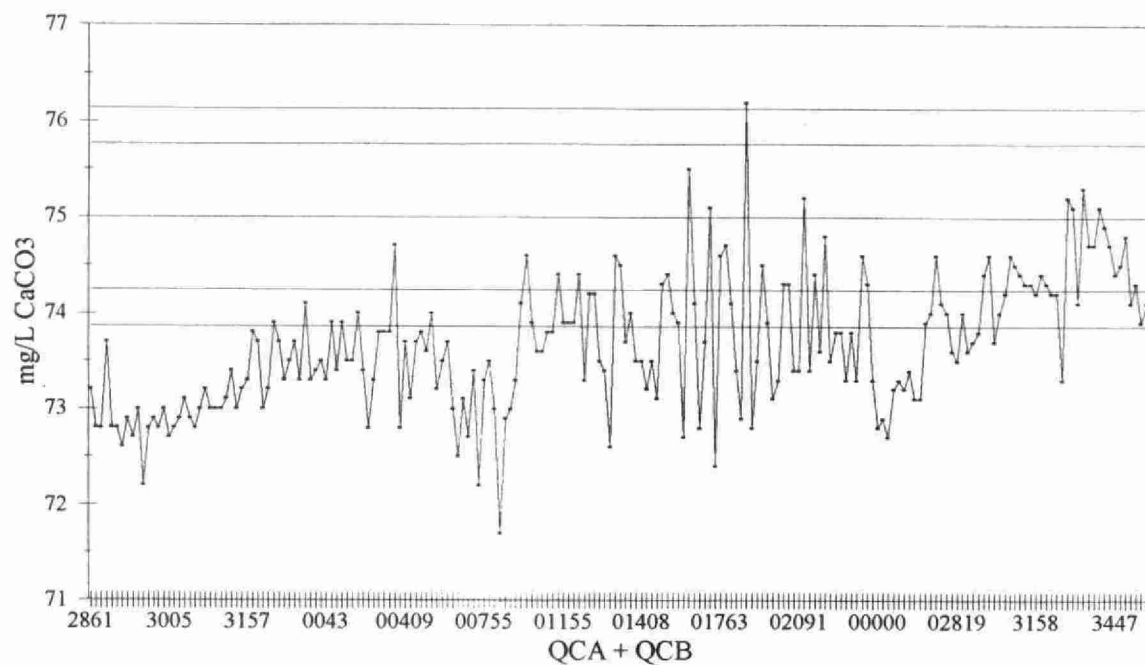
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	203	50	49.0990	-0.9010	0.4671
QCB:	203	25	24.5680	-0.4320	0.3702
QCC:	203	5	4.9802	-0.0198	0.2919
QCA+QCB:	203	75	73.6670	-1.3330	0.7017
QCA-QCB:	203	25	24.5310	-0.4690	0.4671
QCB+QCC:	203	30	29.5482	-0.4518	0.5595
QCB-QCC:	203	20	19.5878	-0.4122	0.3626

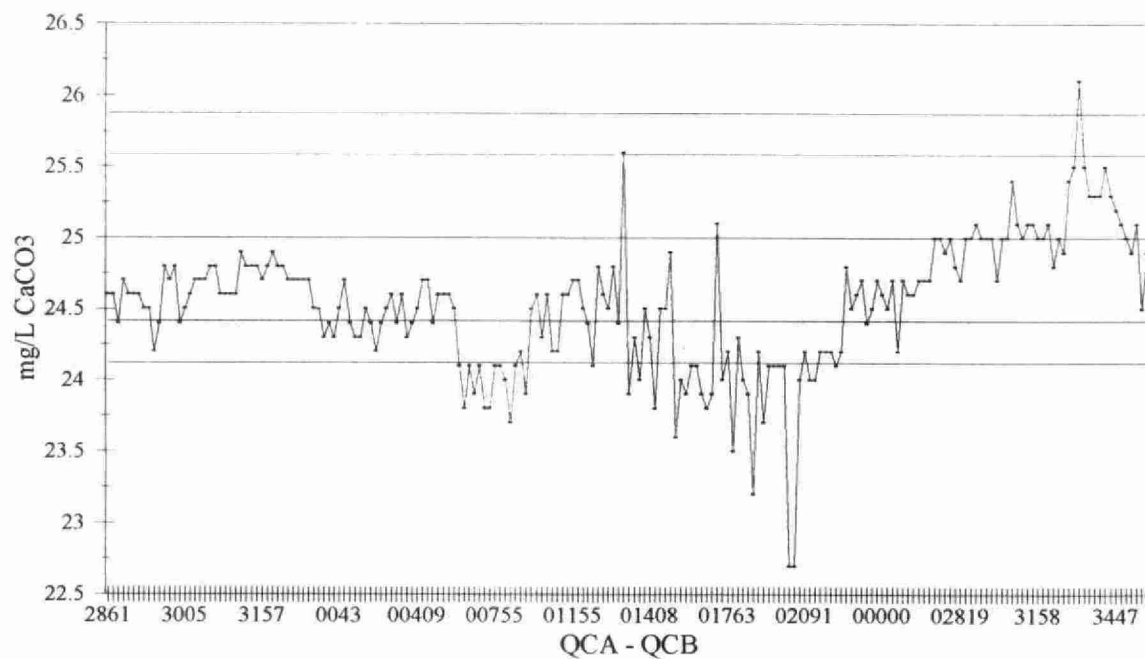
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
212	0 - 40	18.9769	0.1860
126	40 - 100	59.2200	0.6004
82	100 - 200	139.5866	0.7330

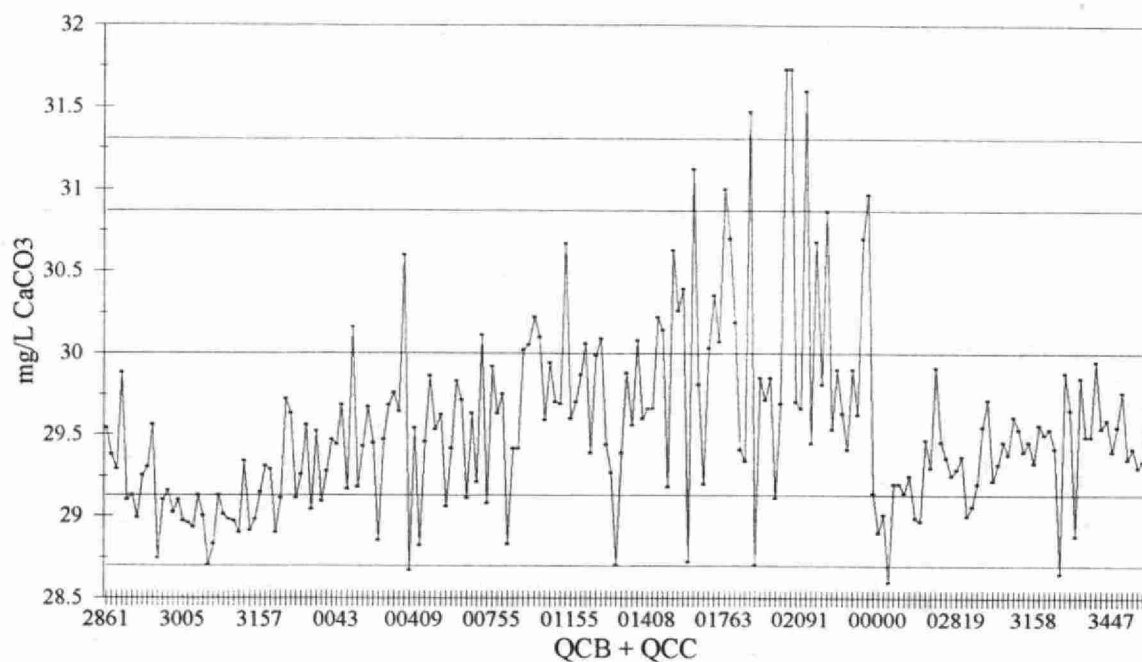
Alkalinity - PHALCO
Quality Control Data: 950101 to 951231



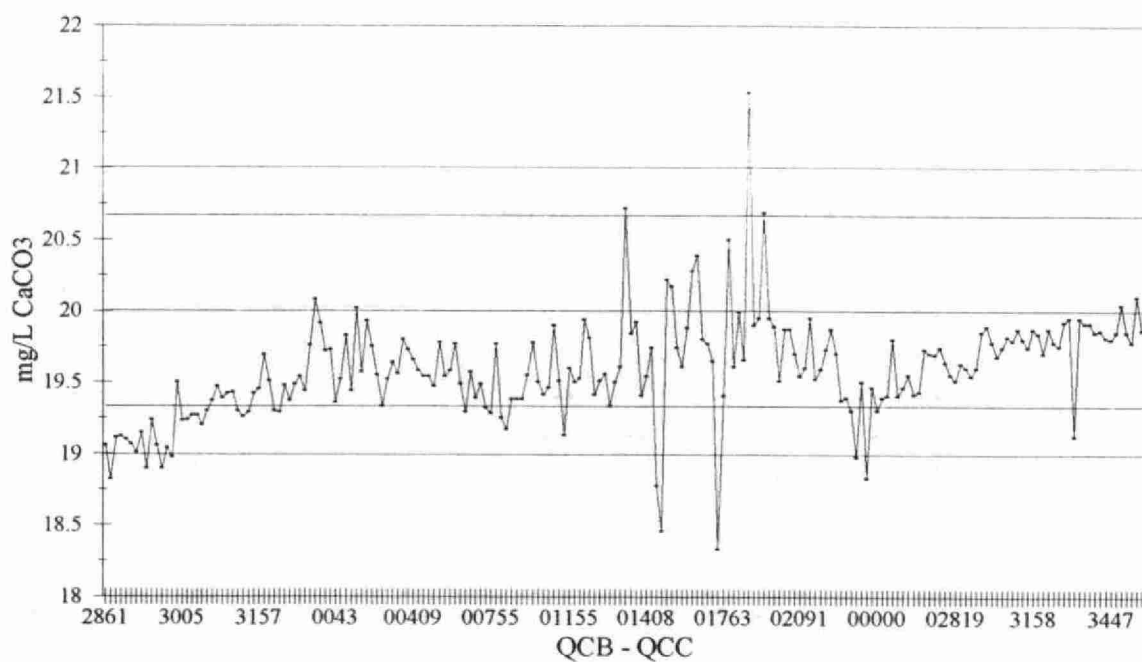
Alkalinity - PHALCO
Quality Control Data: 950101 to 951231



Alkalinity - PHALCO
Quality Control Data: 950101 to 951231



Alkalinity - PHALCO
Quality Control Data: 950101 to 951231



Conductivity - PHALCO

Quality Control Data from 940101 to 941231

Analytical Range: 2000 uS/cm

Detection Limit (W):

n/a

Sw used to calculate control limits -

Sw(A-B): 3.3622

Sw(B-C): 1.2398

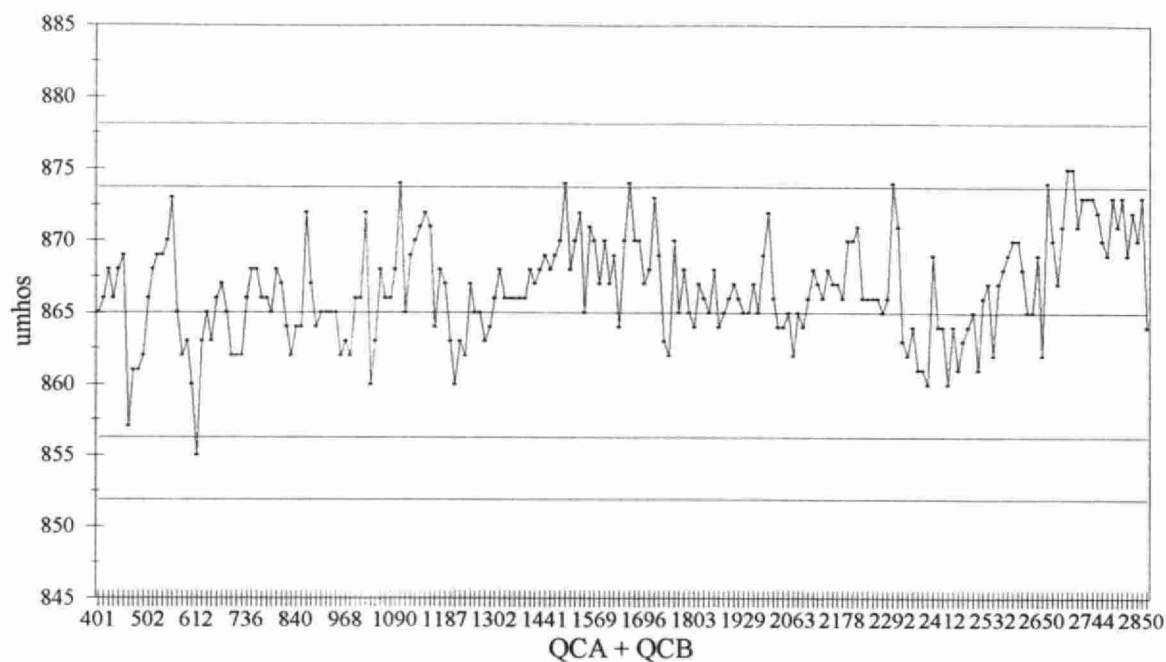
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	212	718	717.5684	-0.4316	2.8945
QCB:	212	147	149.0684	2.0684	1.4230
QCC:	212	74	75.1182	1.1182	0.6960
QCA+QCB:	212	865	866.6368	1.6368	3.5726
QCA-QCB:	212	571	568.5000	-2.5000	2.8360
QCB+QCC:	212	221	224.1866	3.1866	1.9245
QCB-QCC:	212	73	73.9502	0.9502	1.1467

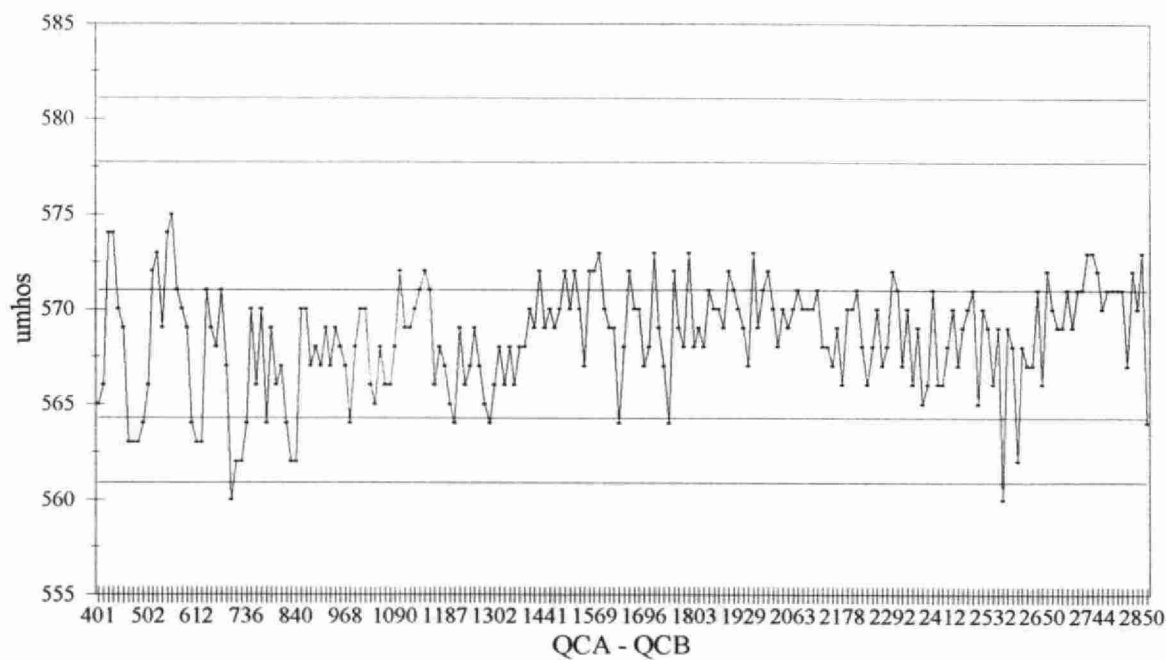
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
452	0 - 40	145.5460	1.6316
102	40 - 100	594.6670	4.4962
21	100 - 200	1387.8100	11.8171

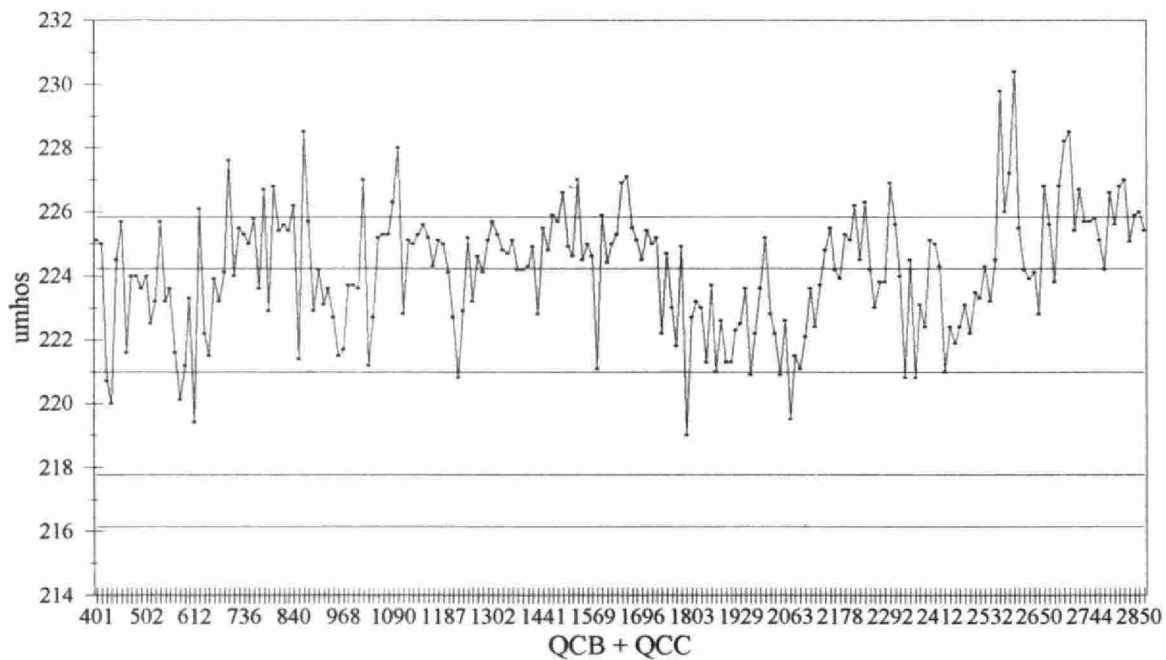
Conductivity - PHALCO
Quality Control Data: 940101 to 941231



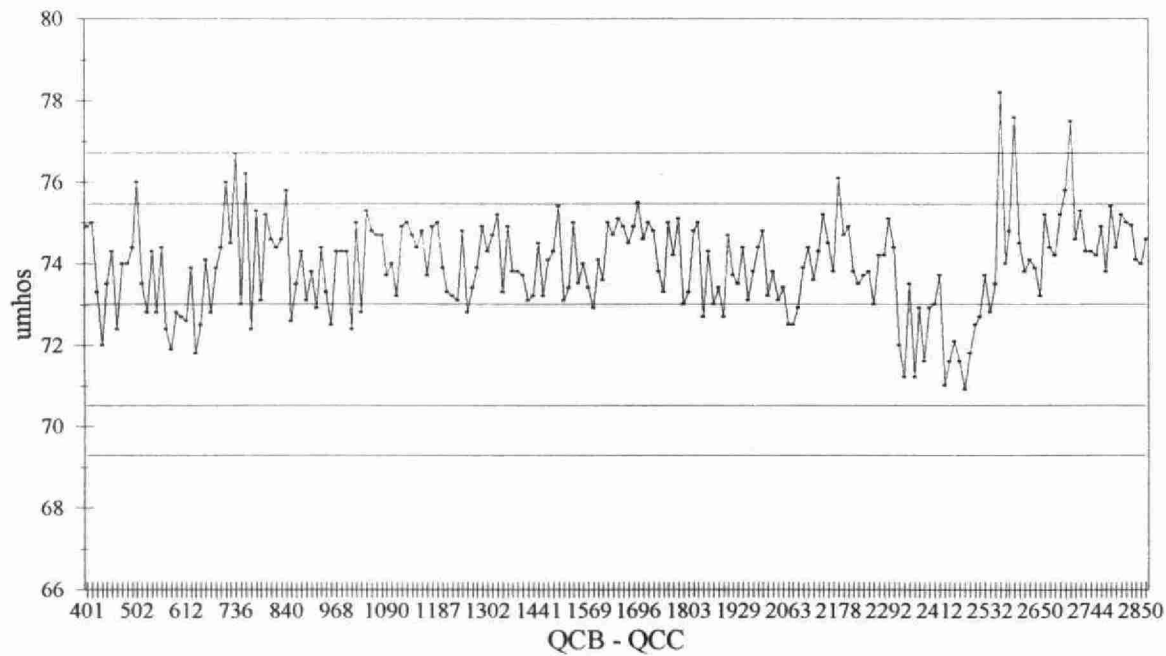
Conductivity - PHALCO
Quality Control Data: 940101 to 941231



Conductivity - PHALCO
Quality Control Data: 940101 to 941231



Conductivity - PHALCO
Quality Control Data: 940101 to 941231



Conductivity - PHALCO

Quality Control Data from 950101 to 951231

Analytical Range: 2000 uS/cm

Detection Limit (W):

n/a

Sw used to calculate control limits -

Sw(A-B): 2.8360

Sw(B-C): 1.1467

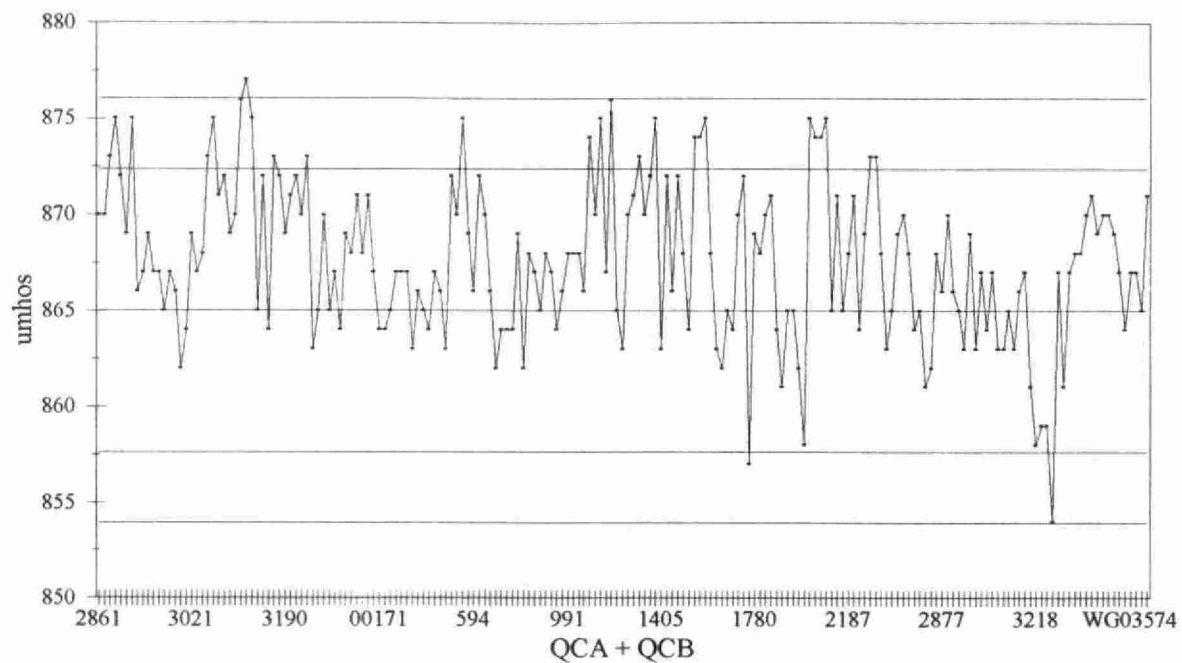
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	191	718	717.9738	-0.0262	3.4632
QCB:	191	147	149.6440	2.6440	1.1738
QCC:	191	74	75.2499	1.2499	0.6259
QCA+QCB:	191	865	867.6178	2.6178	4.1480
QCA-QCB:	191	571	568.3298	-2.6702	3.0884
QCB+QCC:	191	221	224.8939	3.8939	1.6067
QCB-QCC:	191	73	74.3941	1.3941	0.9785

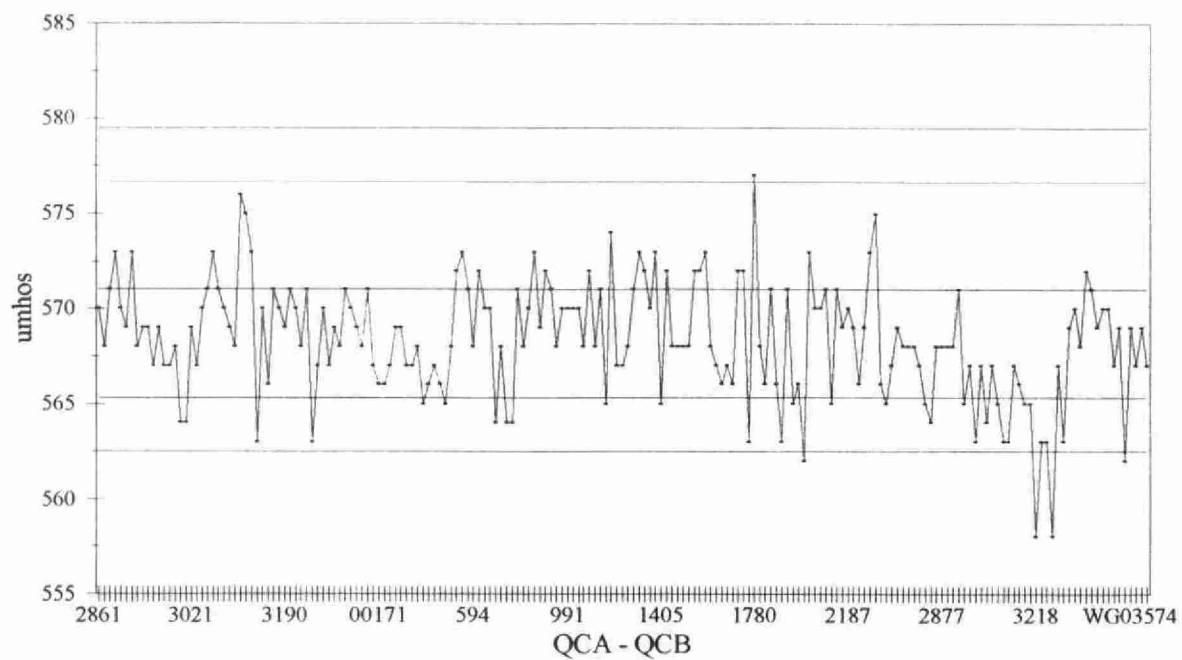
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
329	0 - 40	142.9312	1.6549
81	40 - 100	610.2099	4.5106
24	100 - 200	1328.3330	13.7523

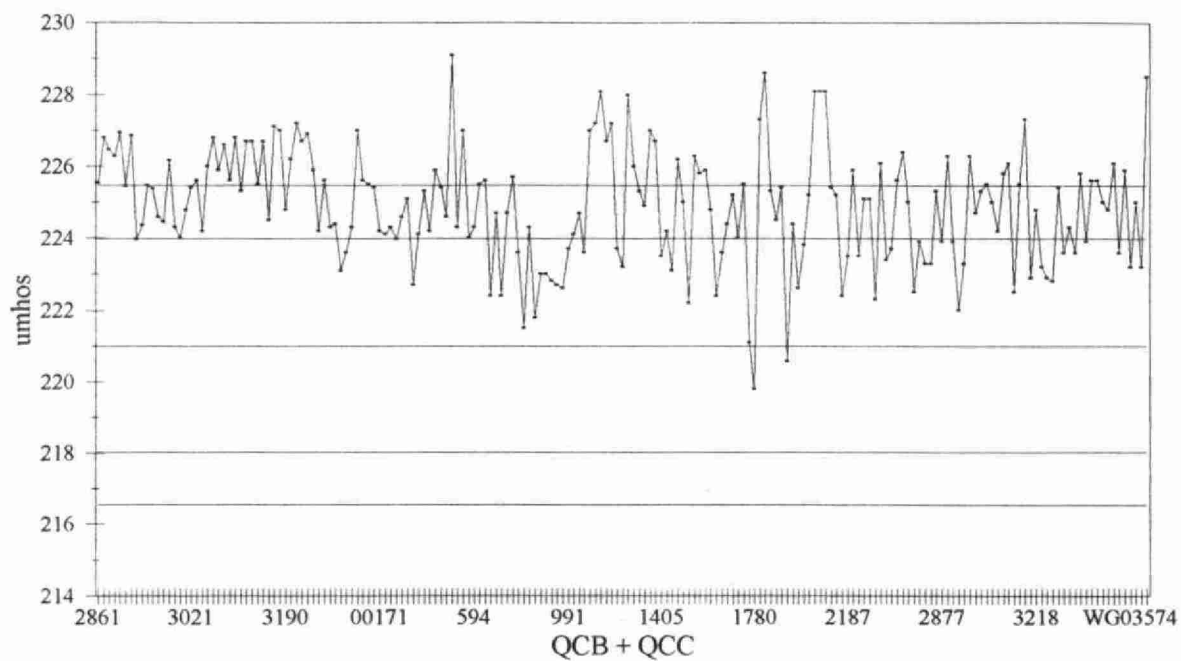
Conductivity - PHALCO
Quality Control Data: 950101 to 951231



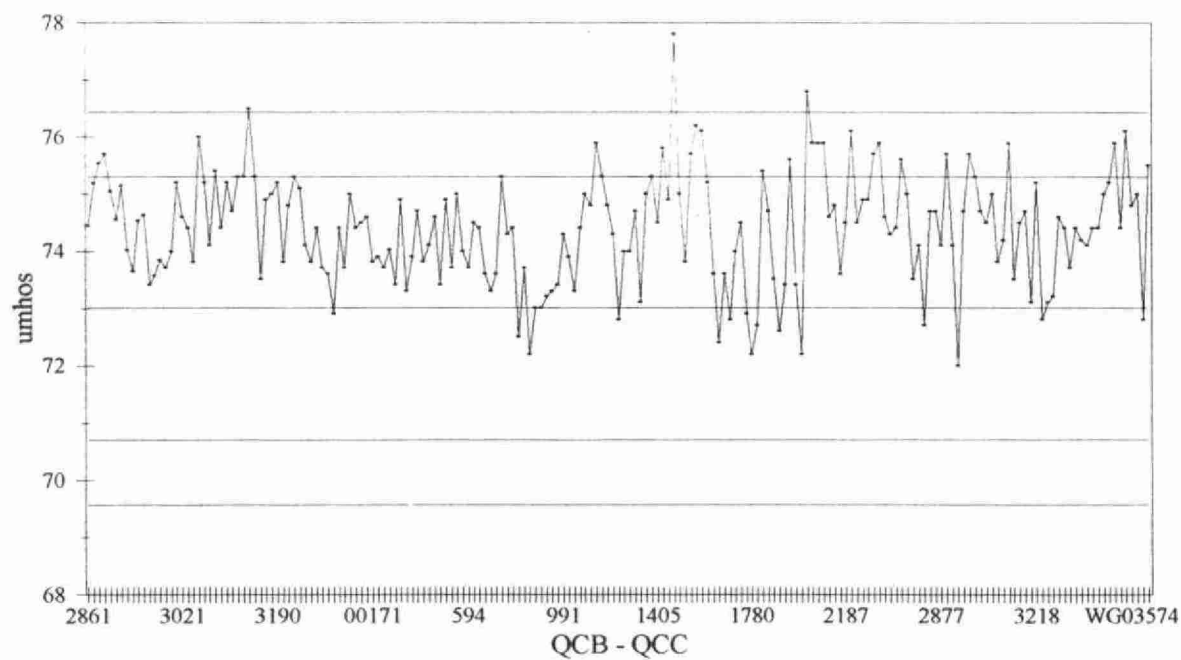
Conductivity - PHALCO
Quality Control Data: 950101 to 951231



Conductivity - PHALCO
Quality Control Data: 950101 to 951231



Conductivity - PHALCO
Quality Control Data: 950101 to 951231



pH - PHALCO

Quality Control Data from 940101 to 941231

Analytical Range: 0 - 14

Detection Limit (W):

n/a

Sw used to calculate control limits -

Sw(A-B):

0.0167

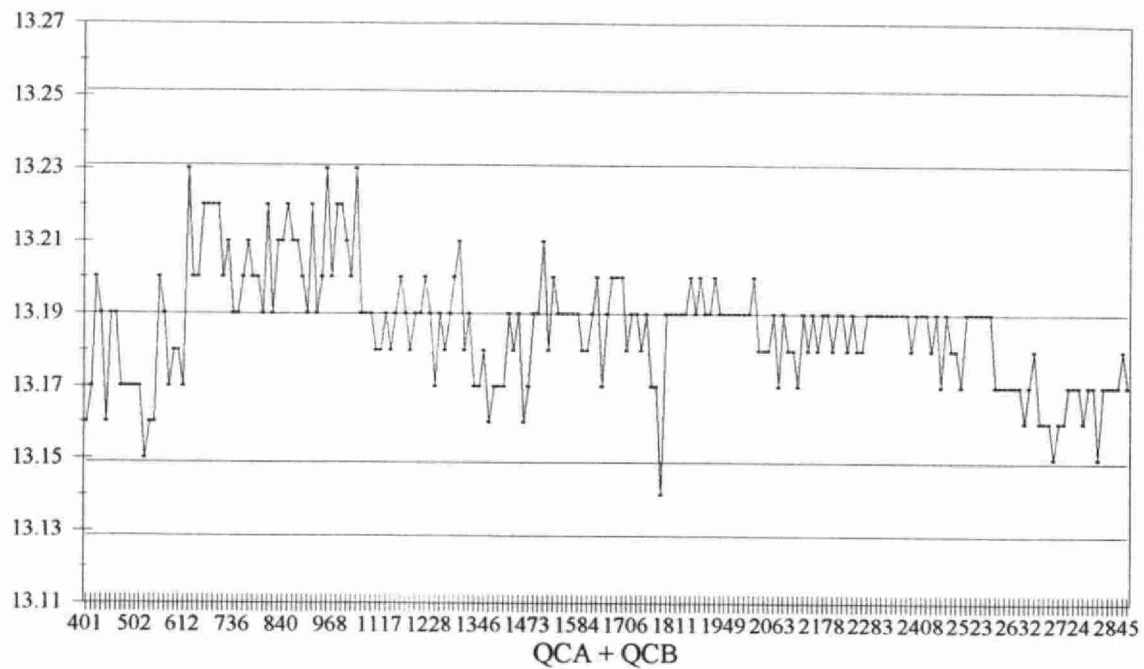
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	213	9.18	9.1766	-0.0034	0.0154
QCB:	213	4.01	4.0094	-0.0006	0.0038
QCA+QCB:	213	13.19	13.1860	-0.0040	0.0159
QCA-QCB:	213	5.17	5.1672	-0.0028	0.0158

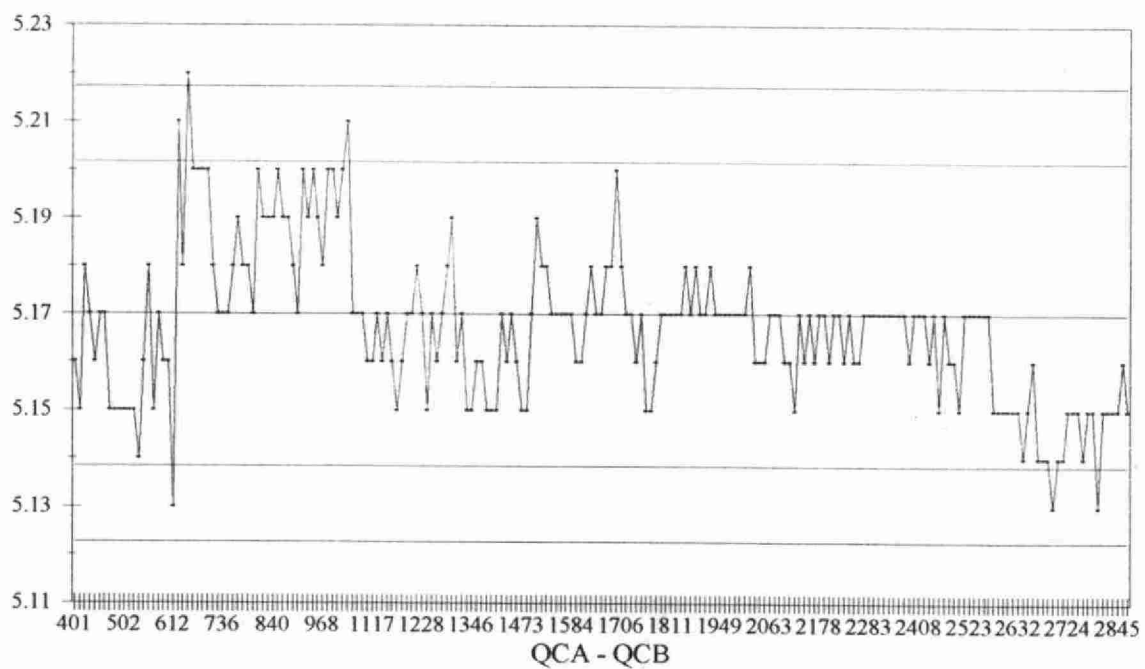
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
3	5.0 - 5.8	5.6370	0.0321
98	5.8 - 7.0	6.5740	0.0662
456	7.0 - 9.0	7.6600	0.1223

pH - PHALCO
Quality Control Data: 940101 to 941231



pH - PHALCO
Quality Control Data: 940101 to 941231



pH - PHALCO

Quality Control Data from 950101 to 951231

Analytical Range: 0 - 14

Detection Limit (W):

n/a

Sw used to calculate control limits -

Sw(A-B):

0.0158

Control Samples:

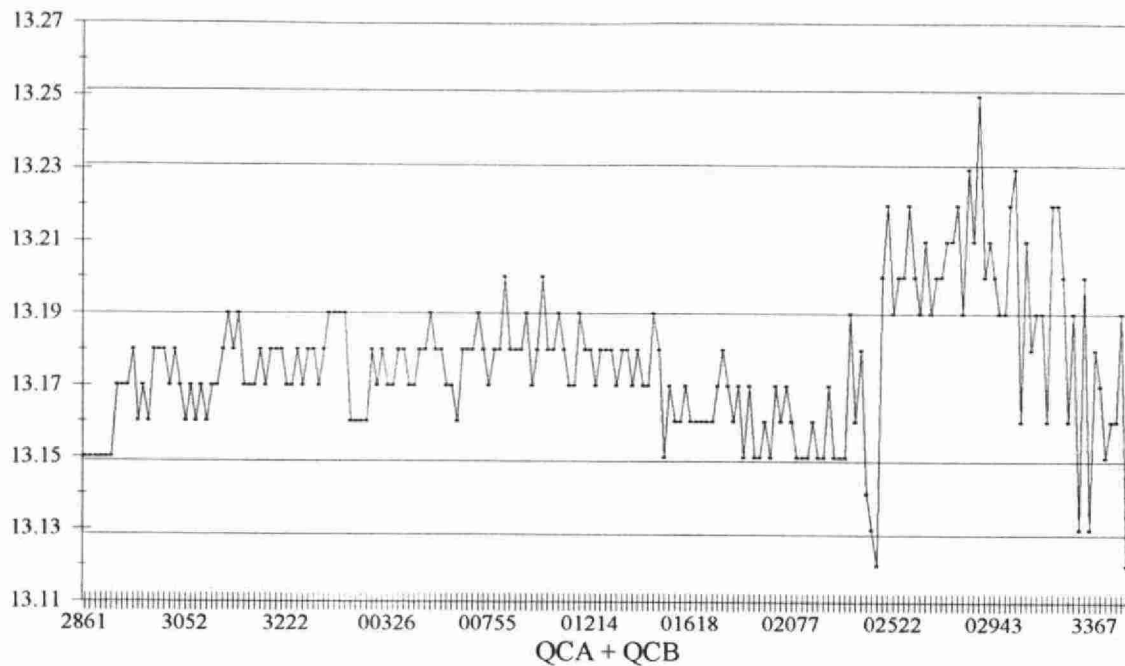
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	198	9.18	9.1663	-0.0137	0.0185
QCB:	198	4.01	4.0093	-0.0007	0.0052
QCA+QCB:	198	13.19	13.1756	-0.0144	0.0200
QCA-QCB:	198	5.17	5.1569	-0.0131	0.0184

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
13	5.0 - 5.8	5.5023	0.0626
98	5.8 - 7.0	6.5787	0.0706
317	7.0 - 9.0	7.6725	0.0770

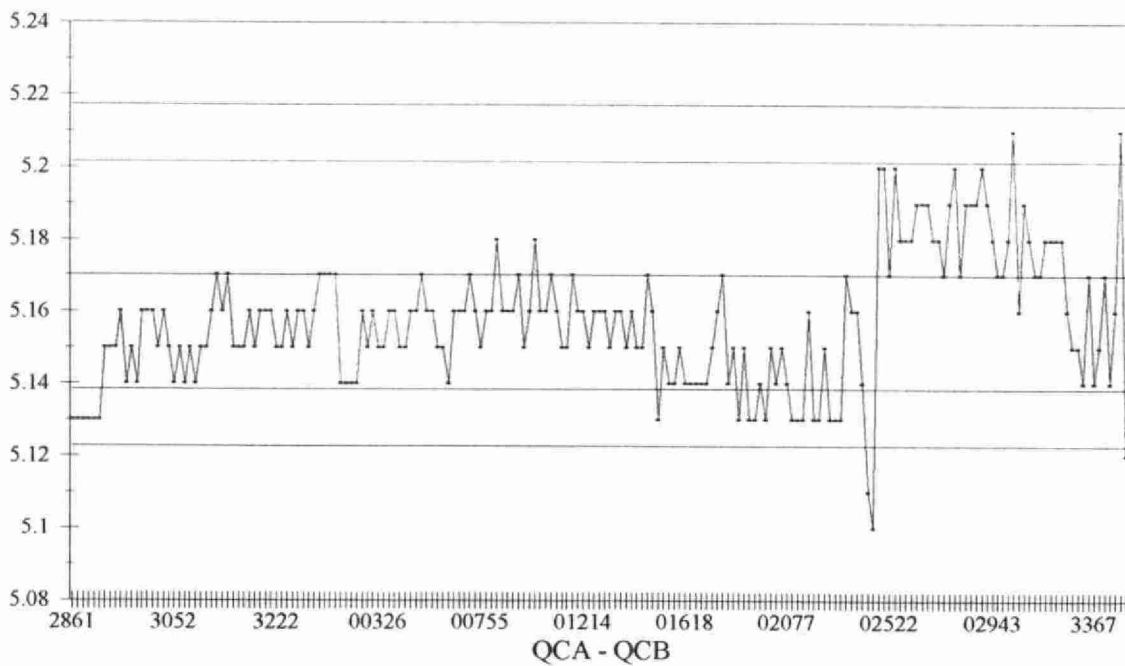
pH - PHALCO

Quality Control Data: 950101 to 951231



pH - PHALCO

Quality Control Data: 950101 to 951231



BIOCHEMICAL OXYGEN DEMAND

IDENTIFICATION:

Method Title: The Determination of Biochemical Oxygen Demand (BOD) in Water, Industrial and Sewage Effluents by Potentiometry.

Method Number: E6027A

Method Introduced: May, 1981

Current Revision: Jan. 01, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	Biochemical Oxygen Demand	.1 mg/L	.5 mg/L

SAMPLE MATRICES:

Sample matrices analyzed are sewage effluents, industrial waste, lechates and surface water.

ANALYTICAL PROCEDURE:

Using dissolved oxygen (DO) analysis, samples are measured for oxygen depletion before and after a five day period of storage in the dark at 20°C. Dilutions are made with aerated, nutrient-enriched water to obtain a 50-75% oxygen depletion. If the sample has been pH adjusted, frozen or is a treated effluent, a sewage seed is added and the appropriate seed correction is made.

CONTROLS AND QUALITY ASSURANCE:

Controls: Long Term Blank
Quality Control Solutions A and B
2 DO Method Blanks

Drift: DO sample after every six samples

Duplicates: 1 for every 20 samples

Interlabs: CAEAL Certified
Ontario Ministry of the Environment and Energy Performance Evaluation Study

Recoveries: Recovery Solutions to check 3 dissolved oxygen drop ranges

Reporting: Maximum Significant Figures: 2
Units: mg/L as BOD

BOD5**Quality Control Data from 940101 to 941231**

Analytical Range: 200 mg/L

Detection Limit (W): .1 mg/L

Sw used to calculate control limits -

Sw(A-B): 6.8924

Control Samples:

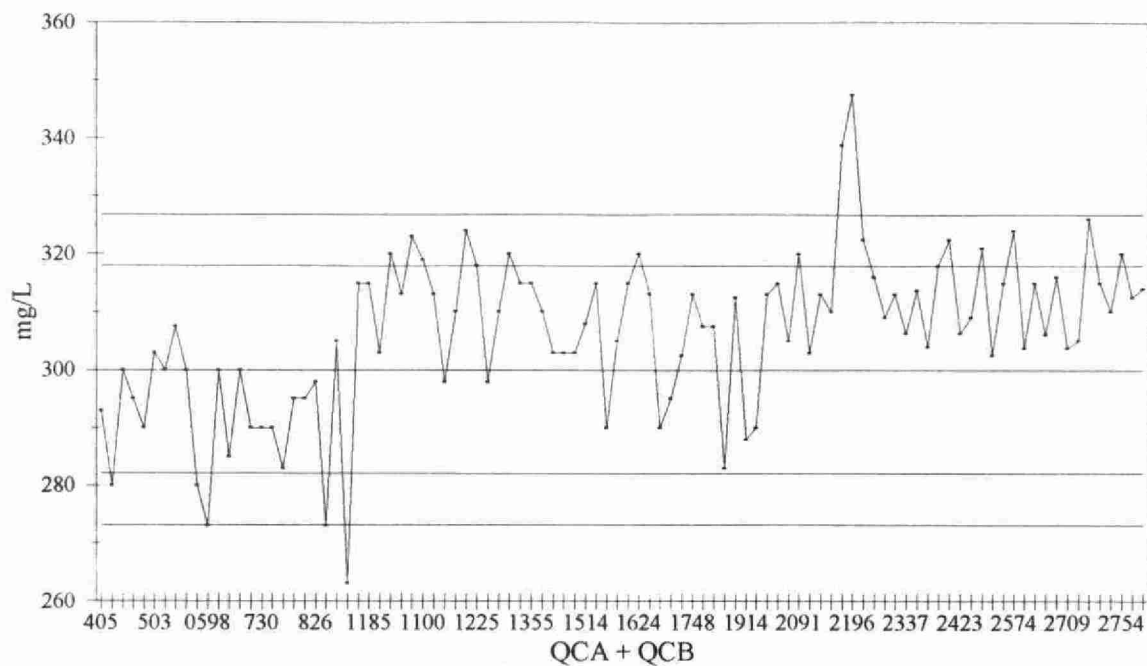
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	98	200	202.1633	2.1633	9.9876
QCB:	98	100	104.0265	4.0265	5.0831
QCA+QCB:	98	300	306.1898	6.1898	13.6691
QCA-QCB:	98	100	98.1367	-1.8633	8.0208

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
121	0 - 40	12.0100	1.0269
71	40 - 100	66.3660	2.9419
20	100 - 200	141.5500	6.8228

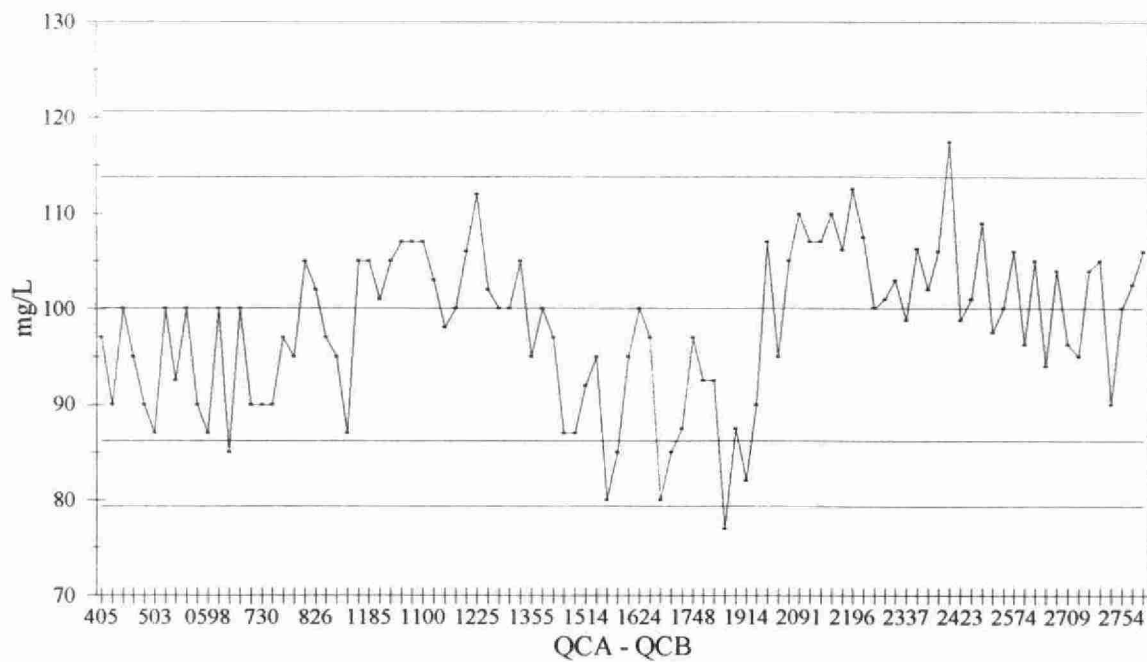
BOD5

Quality Control Data: 940101 to 941231



BOD5

Quality Control Data: 940101 to 941231



BOD5**Quality Control Data from 950101 to 951231**

Analytical Range: 200 mg/L

Detection Limit (W): .1 mg/L

Sw used to calculate control limits -

Sw(A-B): 8.0208

Control Samples:

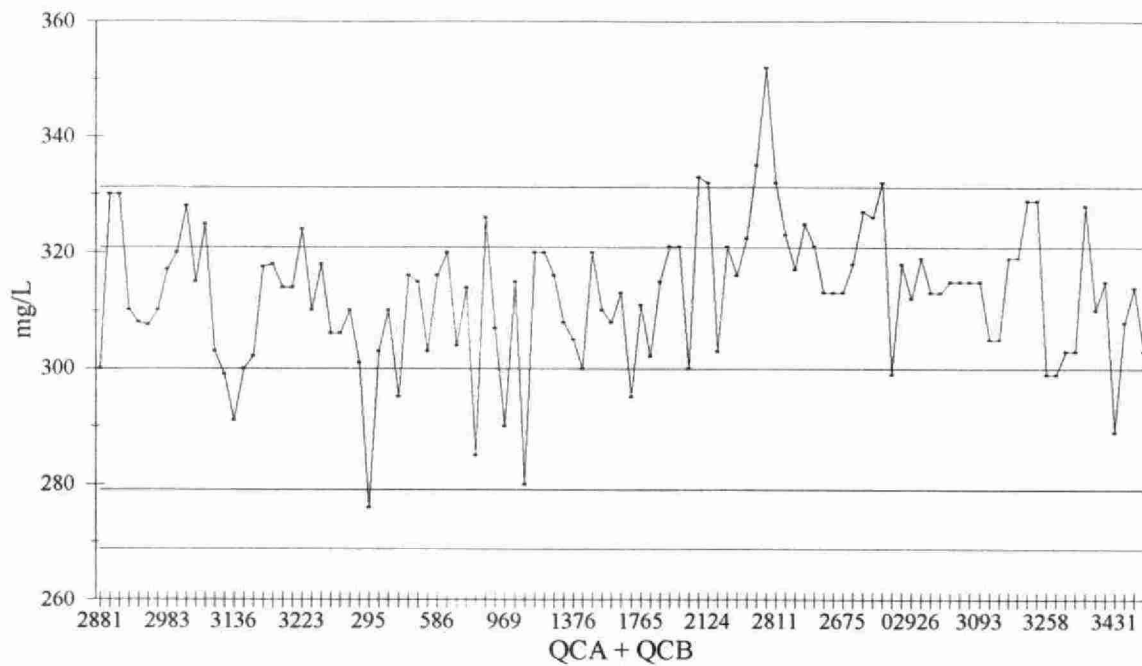
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	109	200	207.9679	7.9679	9.1217
QCB:	109	100	104.6881	4.6881	4.1521
QCA+QCB:	109	300	312.6560	12.6560	12.0246
QCA-QCB:	109	100	103.2798	3.2798	7.5032

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
137	0 - 40	10.6650	0.8507
63	40 - 100	69.4921	4.0766
44	100 - 200	138.7500	6.2058

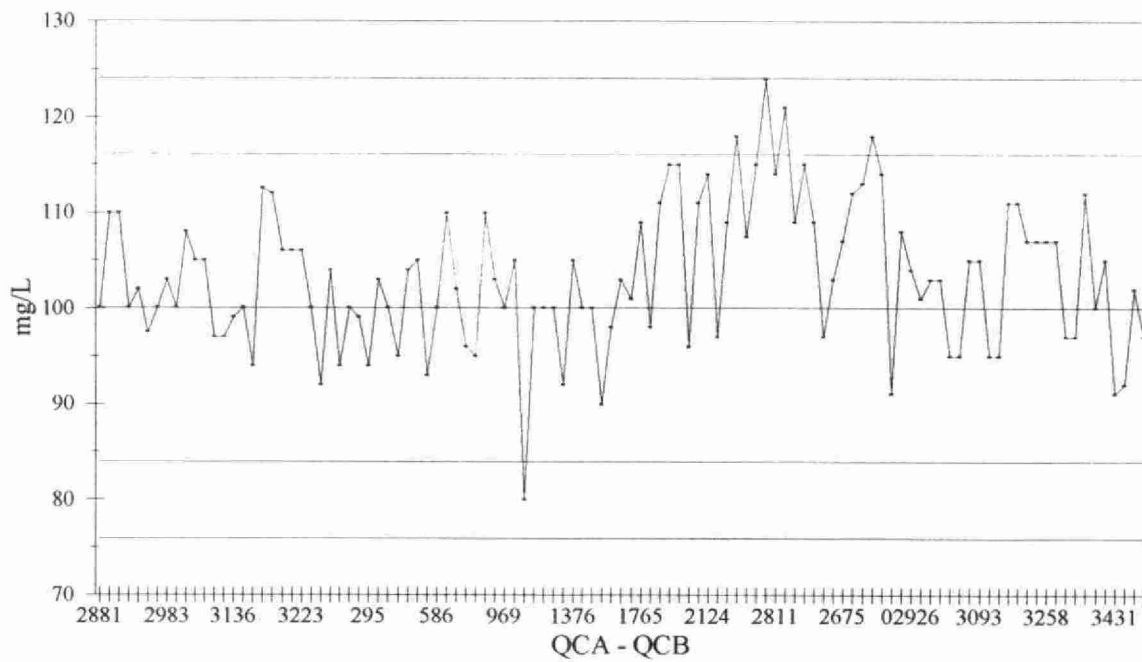
BOD5

Quality Control Data: 950101 to 951231



BOD5

Quality Control Data: 950101 to 951231



CHEMICAL OXYGEN DEMAND

IDENTIFICATION:

Method Title: The Determination of Chemical Oxygen Demand (COD) in Sewage Leachates, Industrial Waste and Water by Colourimetry.

Method Number: E6028A

Method Introduced: February, 1981

Current Revision: Jan. 01, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	Chemical Oxygen Demand	5 mg/L	25 mg/L

SAMPLE MATRICES:

Sample matrices analyzed are sewage, leachates, industrial waste, surface and domestic waters.

ANALYTICAL PROCEDURE:

Samples (5 or 10 mls) are mixed with acidified potassium dichromate which contains mercuric sulphate to suppress chloride interference. After adding concentrated sulphuric acid containing silver sulphate as a catalyst, the mixture is digested in a convection oven for 3 hours at 150°C. The digested standards and blanks are then read using a spectrophotometer.

CONTROLS AND QUALITY ASSURANCE:

Controls: Long Term Blank
Quality Control Solutions A, B and C

Drift: 2 Undigested Blanks, ZERO %T check every 10 samples

Duplicates: 1 for every 10 samples

Interlabs: Ontario Ministry of the Environment and Energy Performance Evaluation Study

Reporting: Maximum Significant Figures: 2
Units: mg/L as O₂

COD

Quality Control Data from 940101 to 941231

Analytical Range: 900 mg/L

Detection Limit (W): 5 mg/L

Sw used to calculate control limits -

Sw(A-B): 9.8668

Sw(B-C): 7.9285

Control Samples:

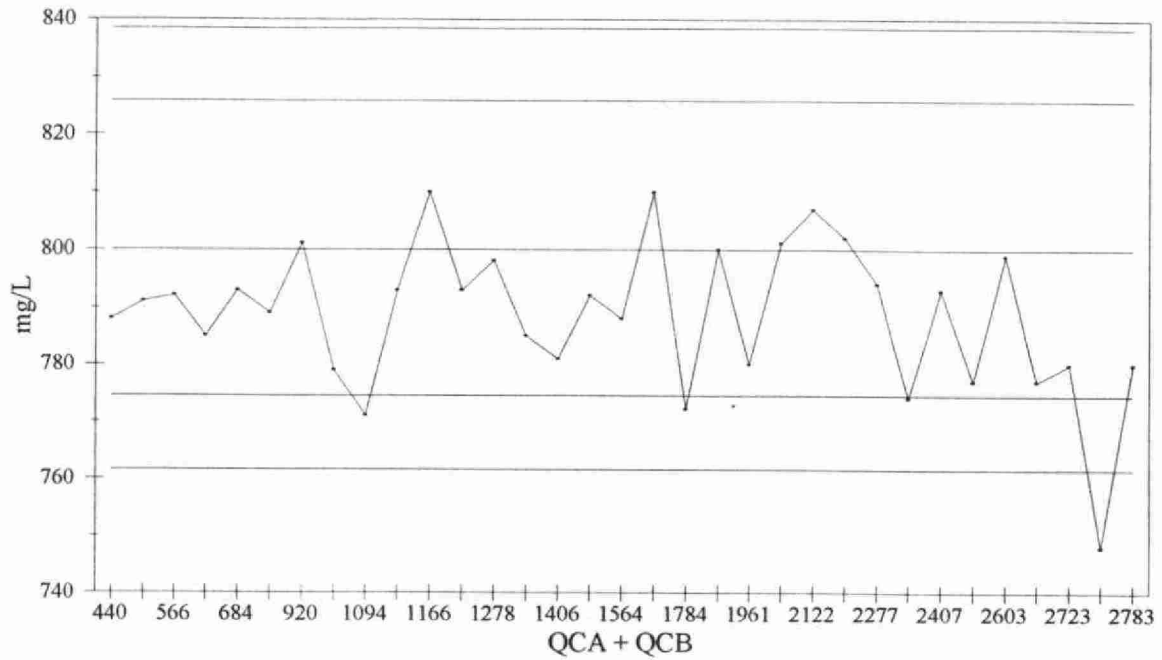
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	33	600	591.4848	-8.5152	9.1177
QCB:	33	200	197.0909	-2.9091	7.0195
QCC:	33	25	22.7212	-2.2788	6.8766
QCA+QCB:	33	800	788.5758	-11.4242	12.8914
QCA-QCB:	33	400	394.3939	-5.6061	9.9308
QCB+QCC:	33	225	219.8121	-5.1879	12.1622
QCB-QCC:	33	175	174.3697	-0.6303	6.7233

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
47	0 - 180	50.1110	5.0841
9	180 - 450	278.8890	7.5166
3	450 - 900	521.1000	23.8677

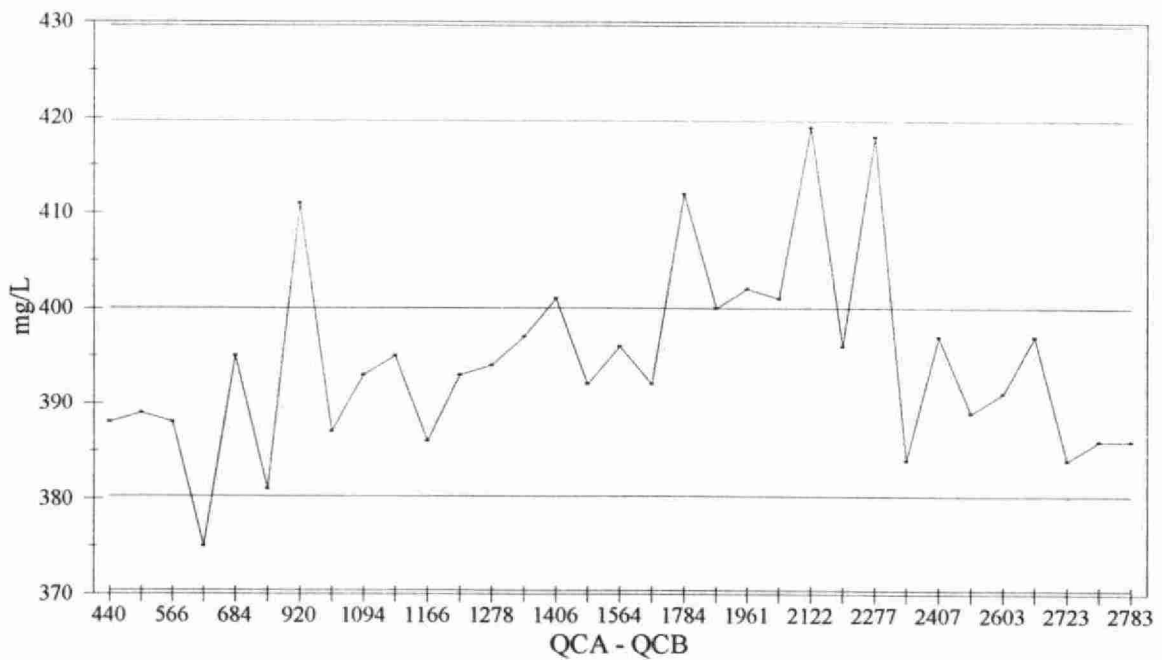
COD

Quality Control Data: 940101 to 941231



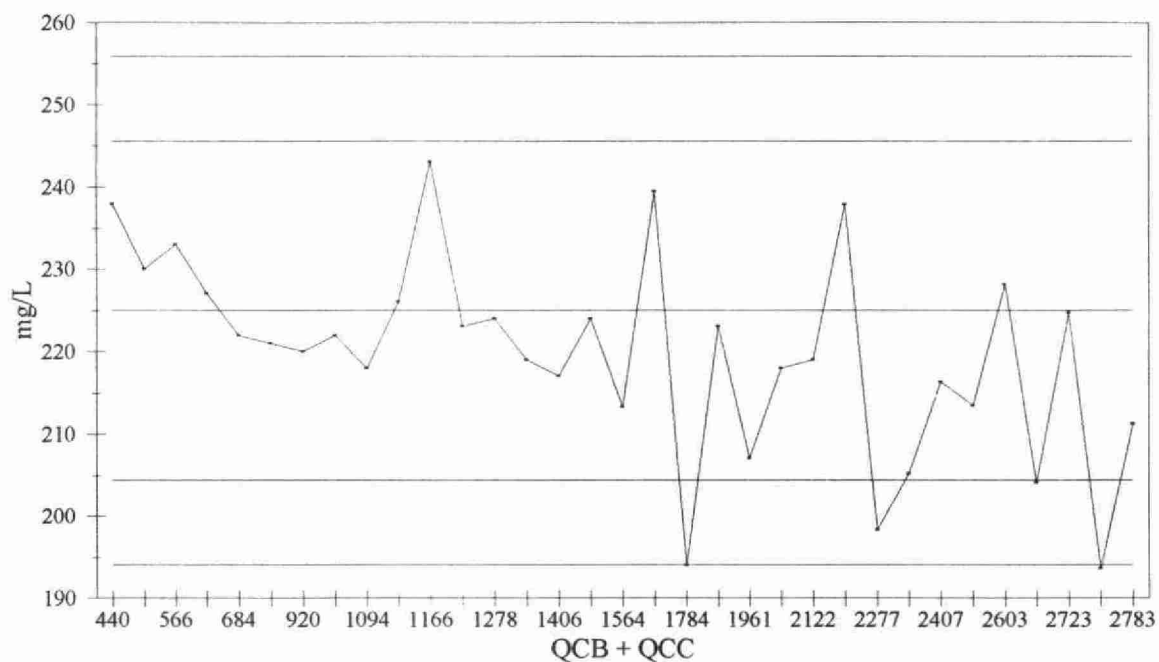
COD

Quality Control Data: 940101 to 941231



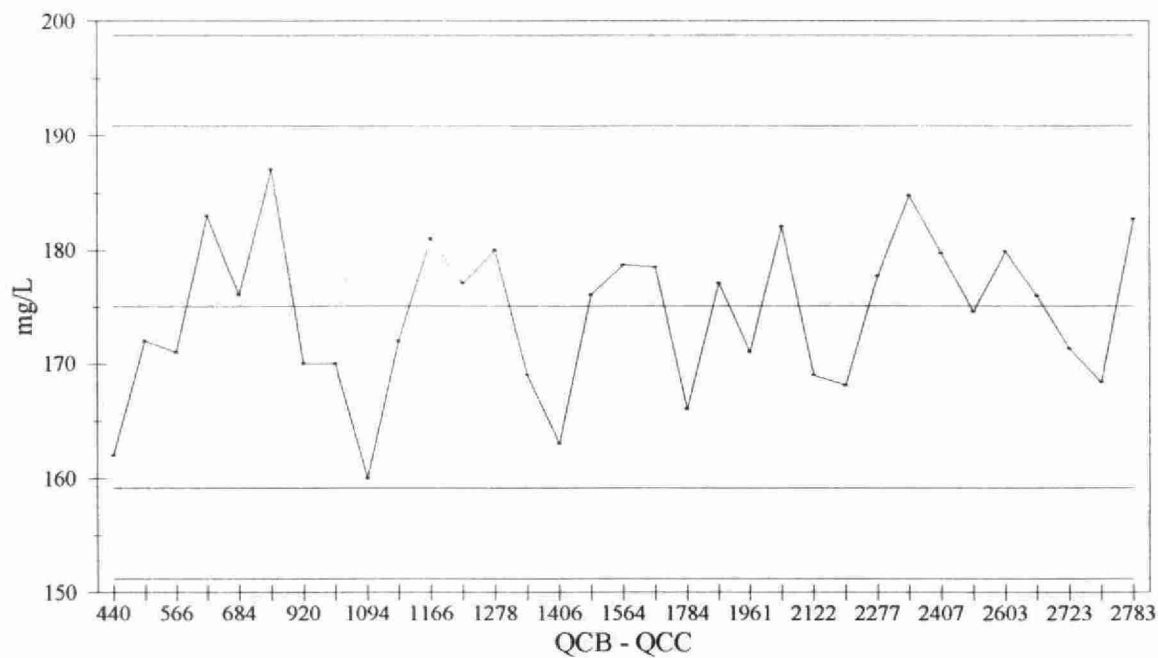
COD

Quality Control Data: 940101 to 941231



COD

Quality Control Data: 940101 to 941231



COD**Quality Control Data from 950101 to 951231**

Analytical Range: 900 mg/L

Detection Limit (W): 5 mg/L

Sw used to calculate control limits -

Sw(A-B): 9.9308

Sw(B-C): 6.7233

Control Samples:

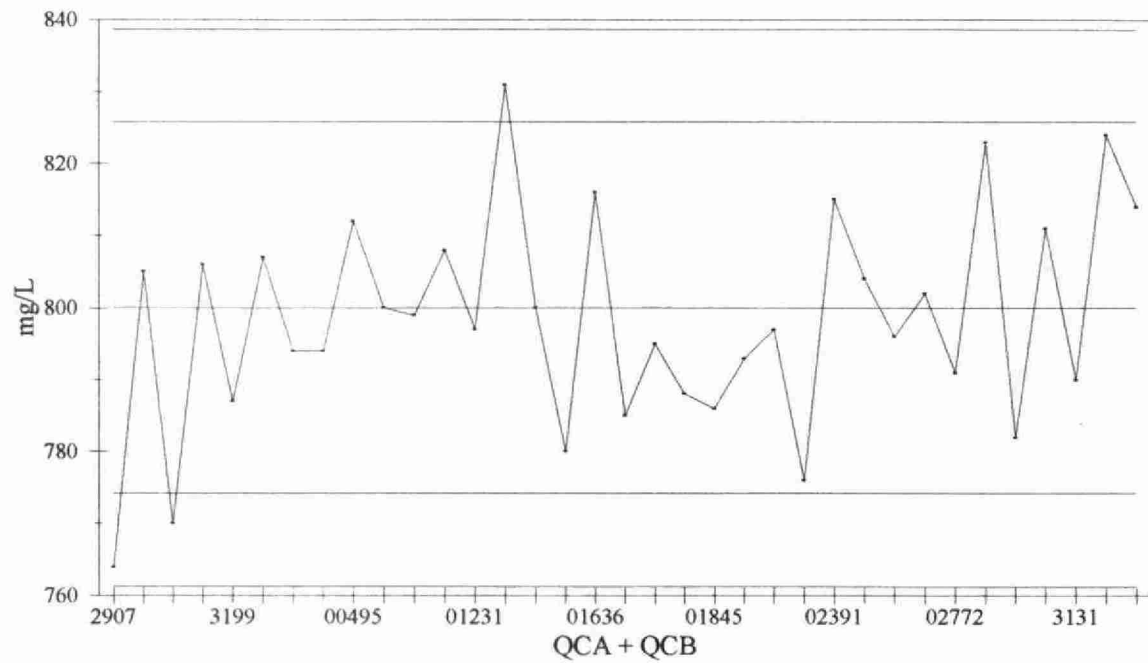
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	35	600	599.6571	-0.3429	10.6769
QCB:	35	200	198.6857	-1.3143	8.0978
QCC:	35	25	20.0200	-4.9800	5.7149
QCA+QCB:	35	800	798.3429	-1.6571	15.0469
QCA-QCB:	35	400	400.9714	0.9714	11.5210
QCB+QCC:	35	225	218.7057	-6.2943	10.5494
QCB-QCC:	35	175	178.6657	3.6657	9.2293

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
58	0 - 180	43.5233	3.8329
13	180 - 450	320.0523	10.5681
4	450 - 900	779.2500	7.1589

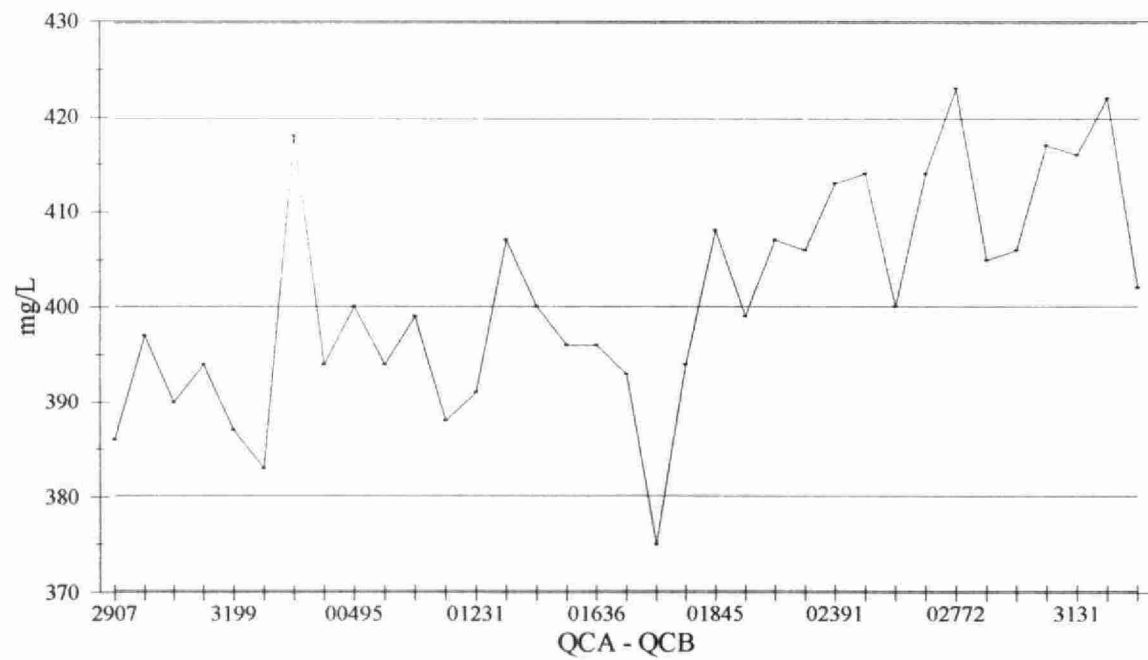
COD

Quality Control Data: 950101 to 951231



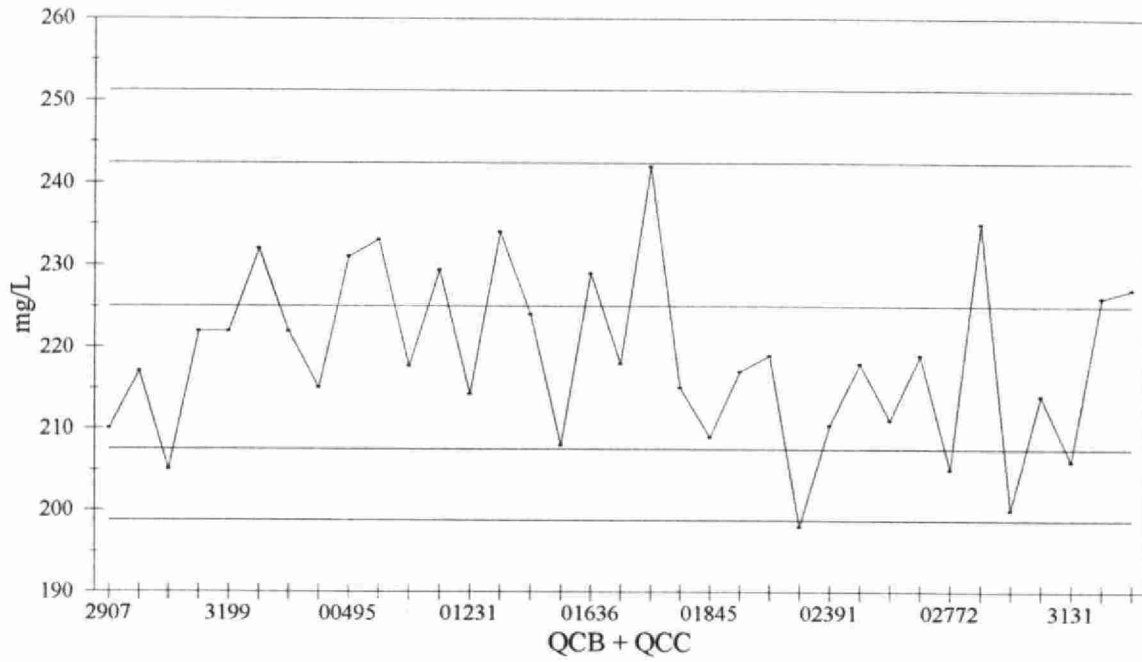
COD

Quality Control Data: 950101 to 951231



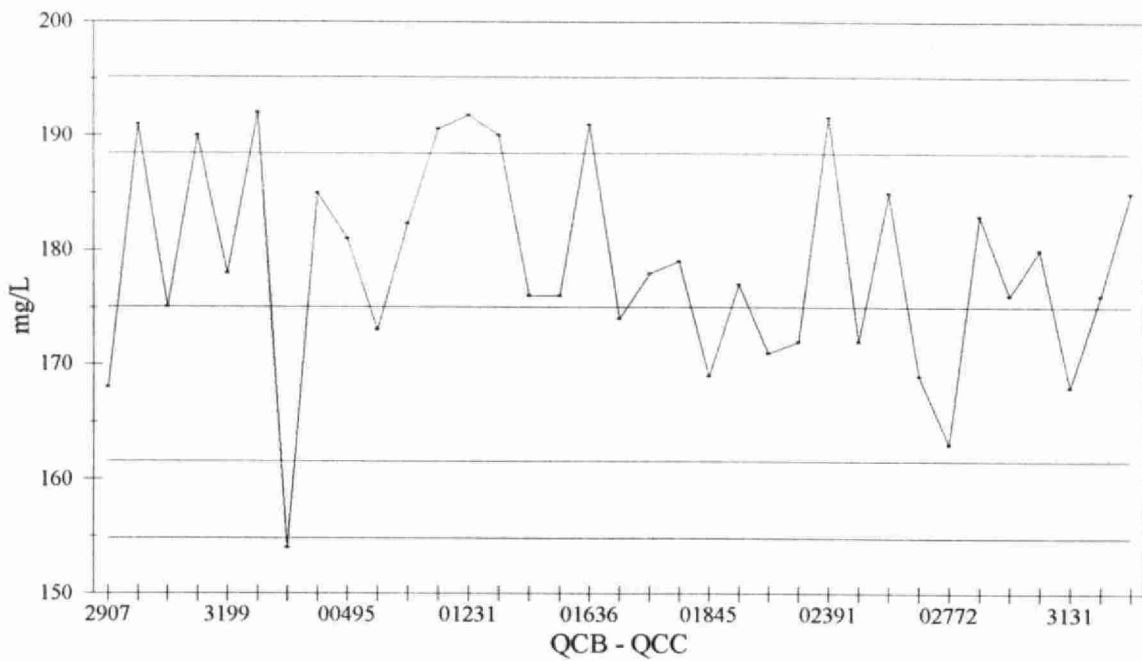
COD

Quality Control Data: 950101 to 951231



COD

Quality Control Data: 950101 to 951231



CHLORIDE

IDENTIFICATION:

Method Title: The Determination of Chloride in Water, Sewage, Leachates and Industrial Wastes by Colourimetry.

Method Number: E6002A

Method Introduced: January 1980

Current Revision: April 24, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	Chloride	.05 mg/L	.25 mg/L

SAMPLE MATRICES:

Sample matrices analyzed are surface water, domestic water, precipitation, sewage, industrial effluent and landfill leachate.

ANALYTICAL PROCEDURE:

Chloride ions combine with mercuric thiocyanate to form mercuric chloride and release thiocyanate ions to complex with the ferric ion producing a coloured solution - the absorbance of which is proportional to the concentration of chloride ion.

CONTROLS AND QUALITY ASSURANCE:

Controls: Long Term Blank
Quality Control Solutions A and B

Drift: Blank after every 10 samples
Sensitivity Checks after every 20 samples

Duplicates: 1 for every 15 samples

Interlabs: CAEAL Certified
Ontario Ministry of the Environment and Energy Performance Evaluation Study
LRTAP and GLAP participant

Reporting: Maximum Significant Figures: 2
Units: mg/L as Cl

Chloride

Quality Control Data from 940101 to 941231

Analytical Range: 10 mg/L

Detection Limit (W): .05 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0461

Control Samples:

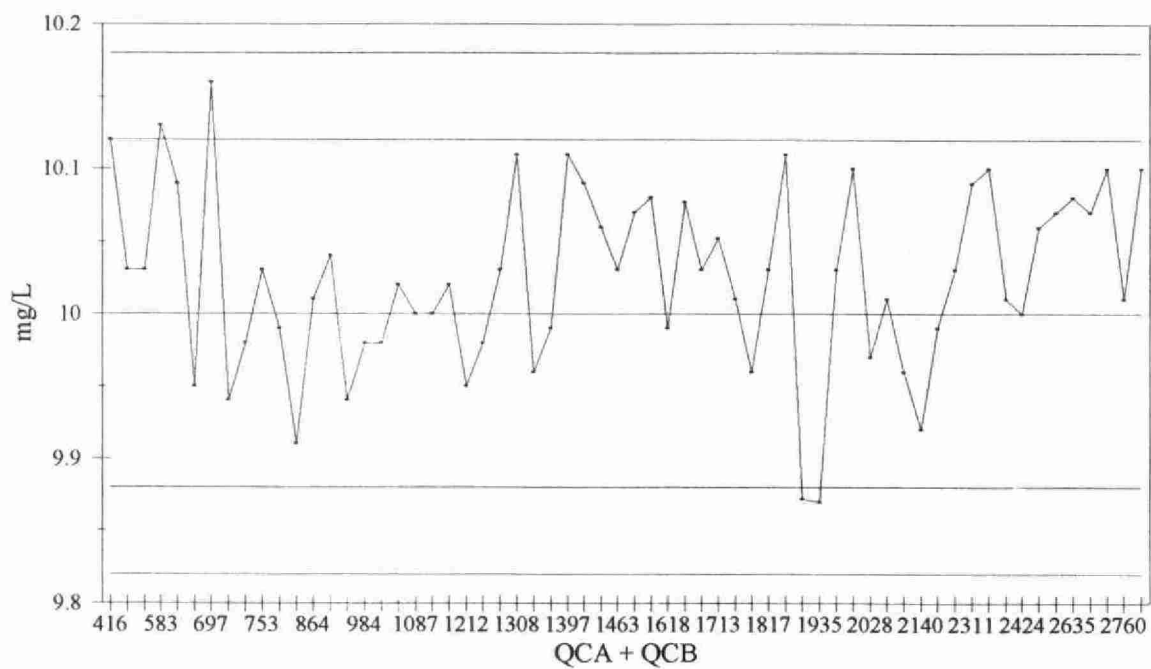
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	62	8	7.9854	-0.0146	0.0471
QCB:	62	2	2.0389	0.0389	0.0401
QCA+QCB:	62	10	10.0244	0.0244	0.0631
QCA-QCB:	62	6	5.9465	-0.0535	0.0607

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
84	0 - 2	0.7891	0.0331
77	2 - 5	3.5221	0.0637
45	5 - 10	6.7820	0.1928

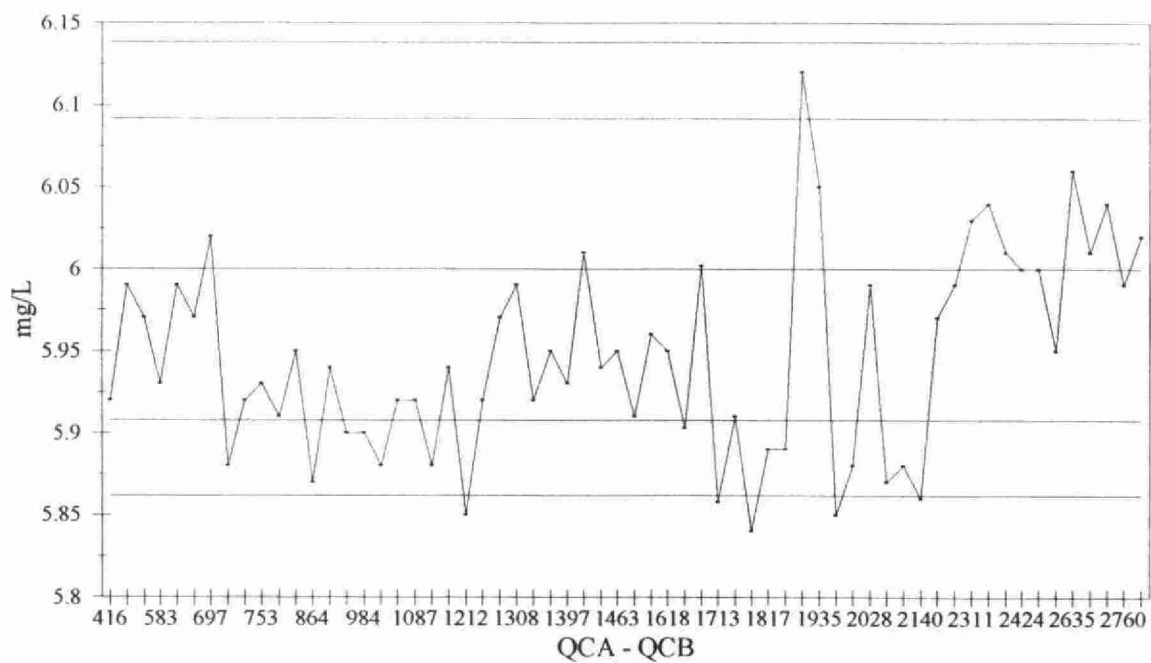
Chloride

Quality Control Data: 940101 to 941231



Chloride

Quality Control Data: 940101 to 941231



Chloride

Quality Control Data from 950101 to 951231

Analytical Range: 10 mg/L

Detection Limit (W): .05 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0607

Control Samples:

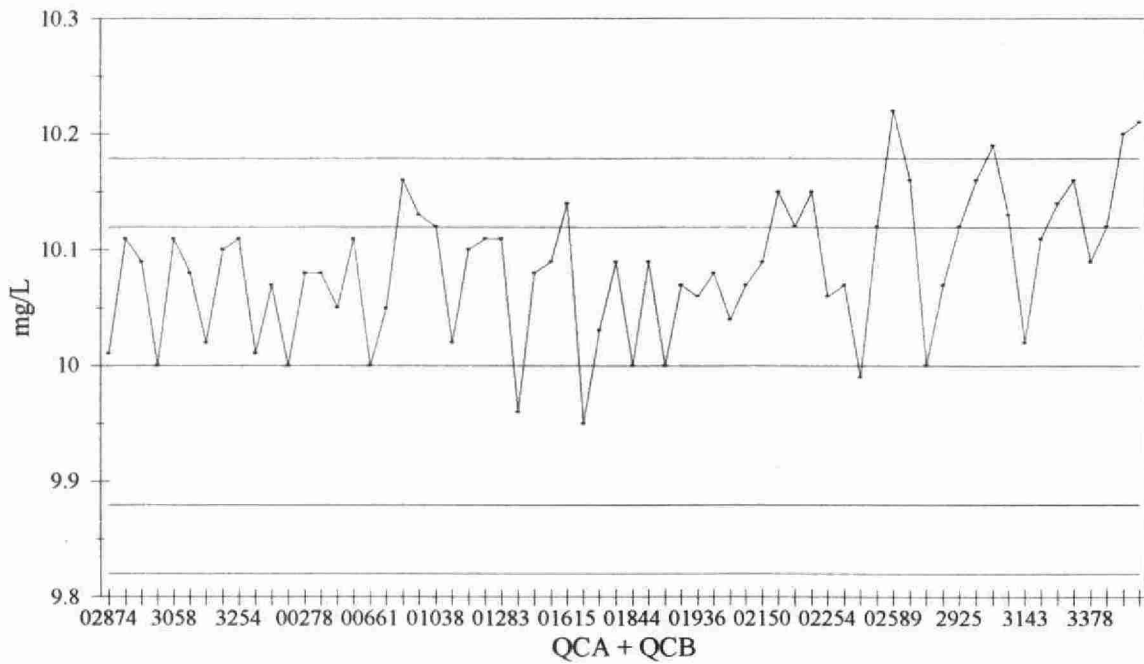
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	64	8	8.0411	0.0411	0.0383
QCB:	64	2	2.0438	0.0437	0.0392
QCA+QCB:	64	10	10.0848	0.0848	0.0605
QCA-QCB:	64	6	5.9973	-0.0027	0.0485

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
72	0 - 2	0.8816	0.0254
49	2 - 5	3.6769	0.0486
34	5 - 10	7.0156	0.1168

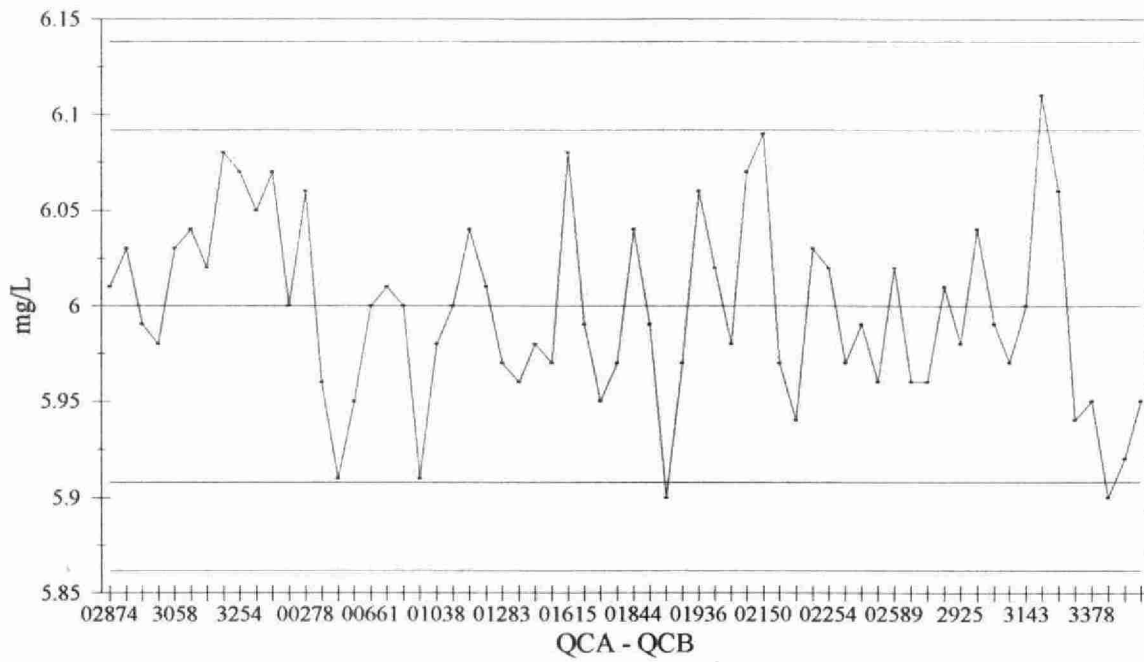
Chloride

Quality Control Data: 950101 to 951231



Chloride

Quality Control Data: 950101 to 951231



TRUE COLOUR

IDENTIFICATION:

Method Title: The Determination of True Colour Water, and Industrial Wastes by Colourimetry.

Method Number: E6004A

Method Introduced: 1978

Current Revision: January 1, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	True Colour	.5 TCU	2.5 TCU

SAMPLE MATRICES:

Sample matrices analyzed are surface water, domestic water, leachates and industrial effluents.

ANALYTICAL PROCEDURE:

True colour is measured colourimetrically on the supernatant of a settled sample in a system calibrated with acidified chloroplatinate standards. The sample stream is measured using a broadband blue filter. Residual turbidity effects are suppressed by using a broadband red filter and increased path length in the reference stream.

CONTROLS AND QUALITY ASSURANCE:

Controls: Long Term Blank
Quality Control Solutions A, B and C

Drift: Blank after every 10 samples
Sensitivity Checks after every 20 samples

Duplicates: 1 for every 20 samples

Interlabs: LRTAP and GLAP participant

Reporting: Maximum Significant Figures: 2
Units: TCU

Colour

Quality Control Data from 940101 to 941231

Analytical Range: 80 TCU

Detection Limit (W): 0.5 TCU

Sw used to calculate control limits -

Sw(A-B): 0.4409

Sw(B-C): 0.3153

Control Samples:

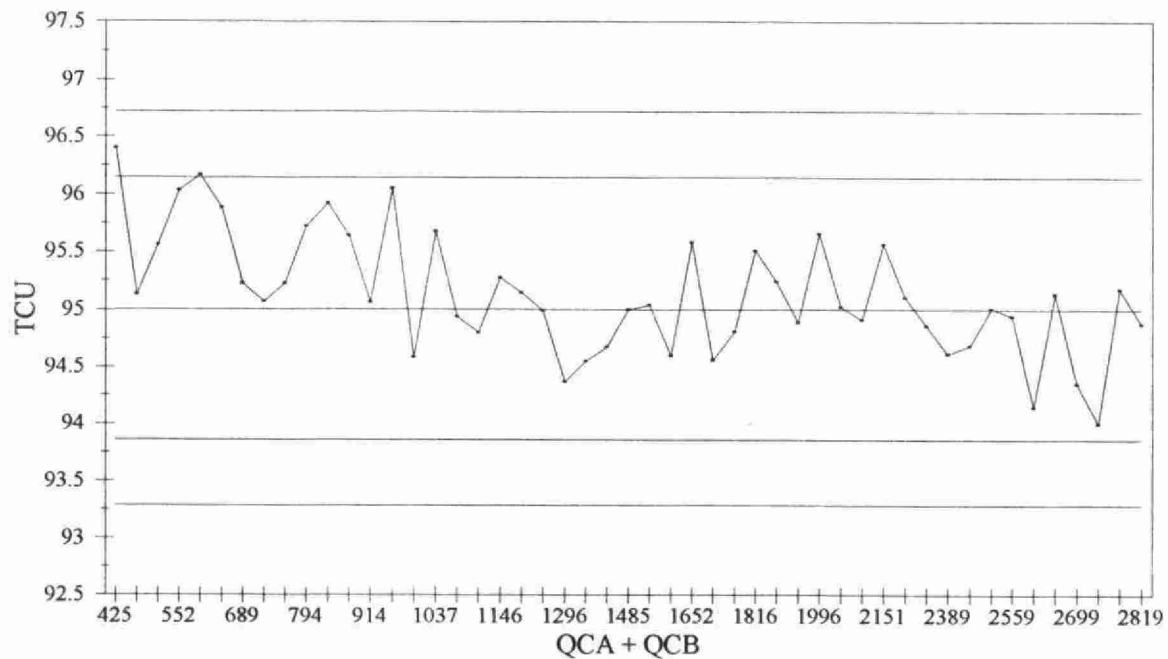
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	49	70	69.8358	-0.1642	0.3492
QCB:	49	25	25.2940	0.2940	0.2702
QCC:	49	7	6.7925	-0.2075	0.1551
QCA+QCB:	49	95	95.1298	0.1298	0.5291
QCA-QCB:	49	45	44.5418	-0.4582	0.3315
QCB+QCC:	49	32	32.0865	0.0865	0.3300
QCB-QCC:	49	18	18.5015	0.5015	0.2919

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
101	0 - 16	6.7650	0.3288
57	16 - 40	28.7640	0.7684
27	40 - 80	50.7700	1.2795

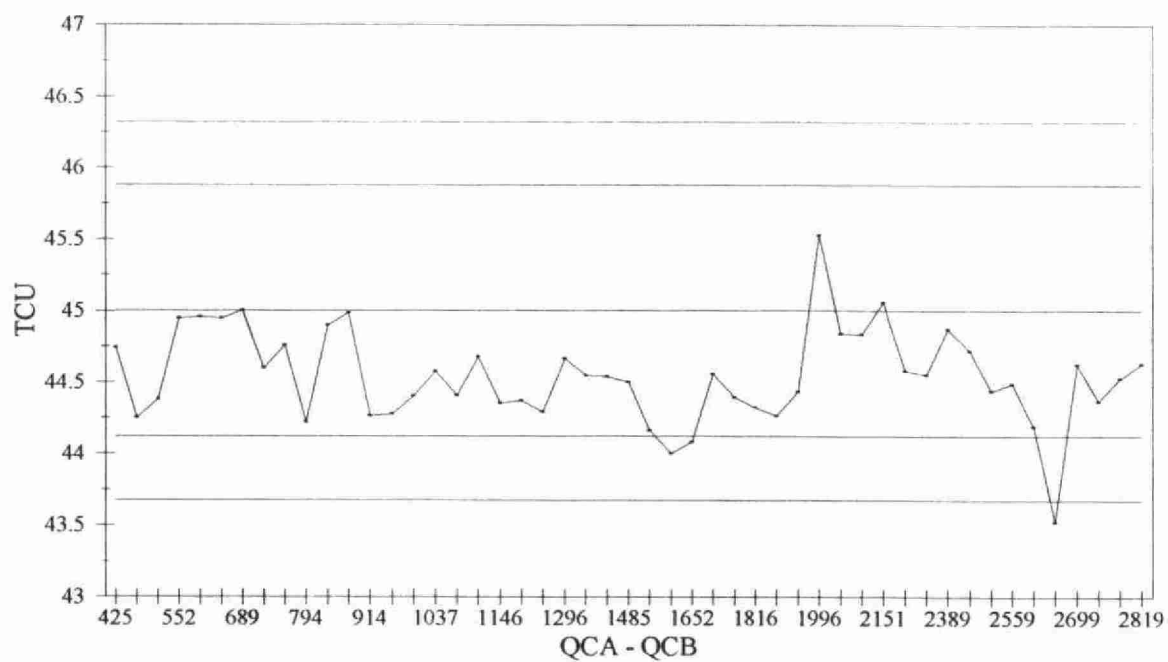
Colour

Quality Control Data: 940101 to 941231



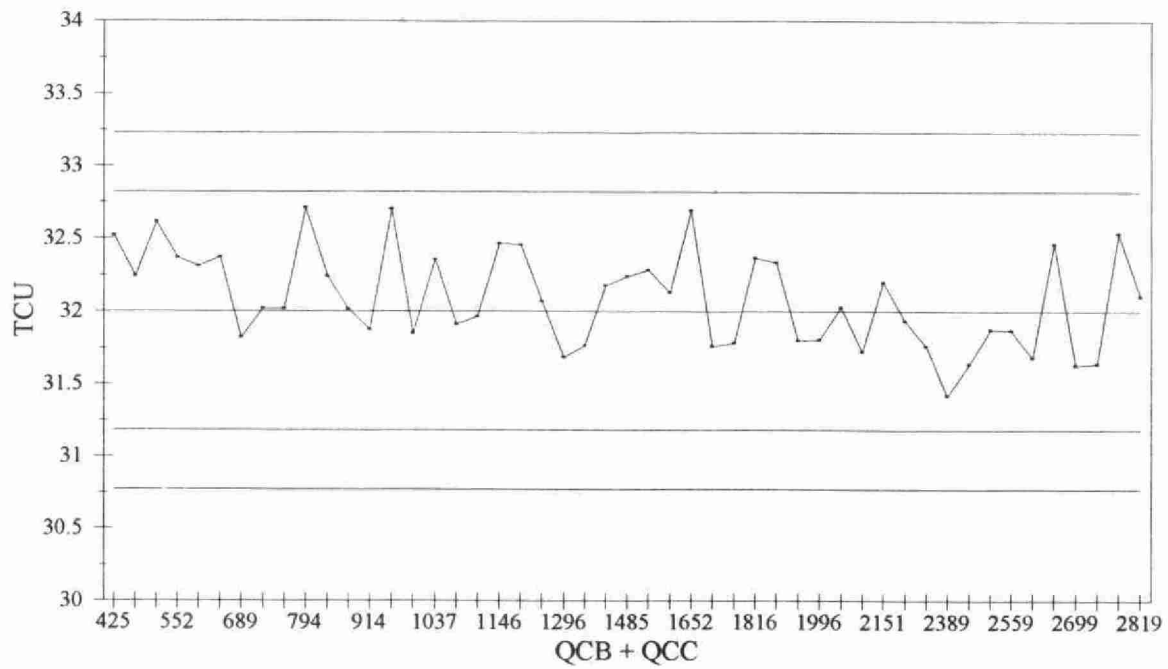
Colour

Quality Control Data: 940101 to 941231



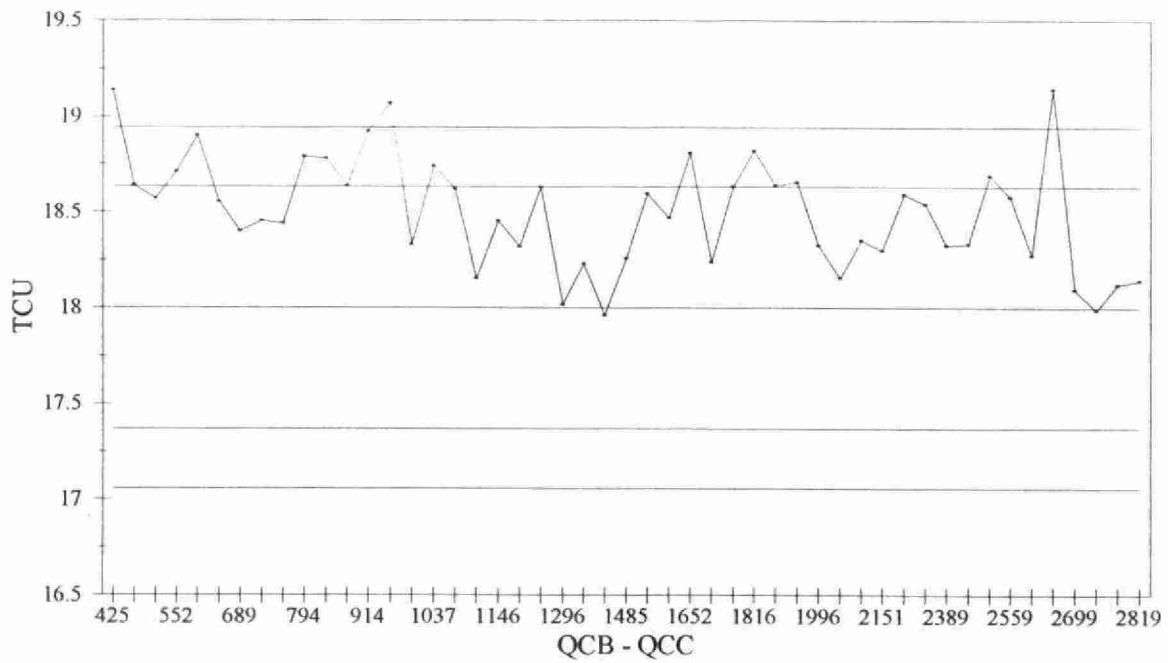
Colour

Quality Control Data: 940101 to 941231



Colour

Quality Control Data: 940101 to 941231



Colour

Quality Control Data from 950101 to 951231

Analytical Range: 80 TCU

Detection Limit (W): 0.5 TCU

Sw used to calculate control limits -

Sw(A-B): 0.3315

Sw(B-C): 0.2919

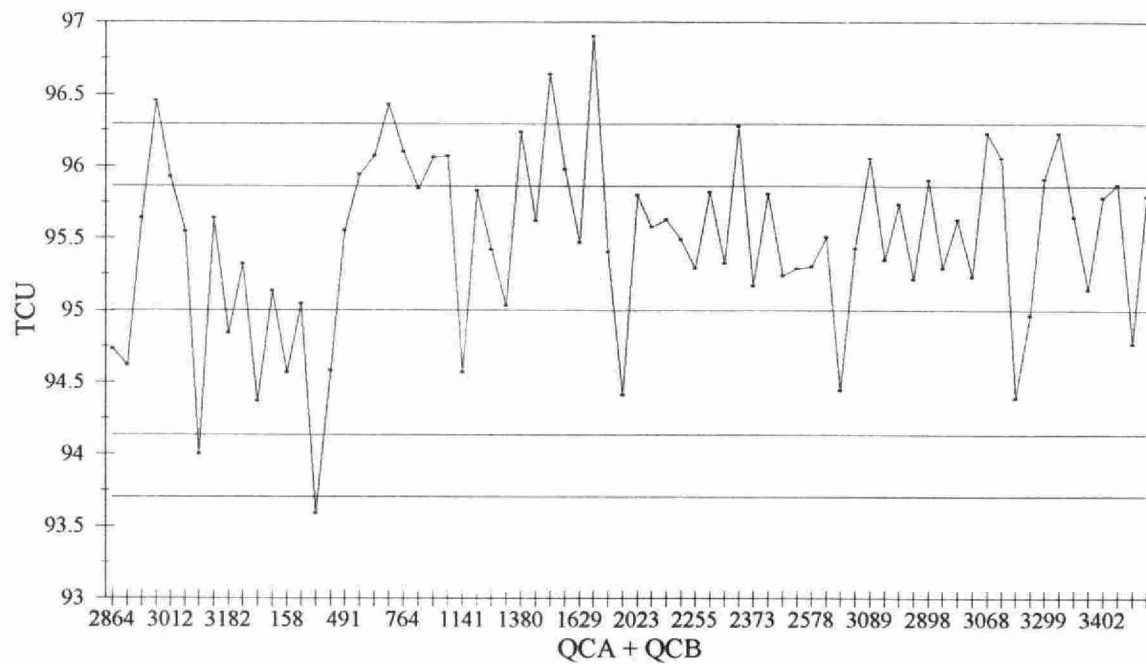
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	72	70	70.1376	0.1376	0.4388
QCB:	72	25	25.3375	0.3375	0.3063
QCC:	72	7	6.8272	-0.1728	0.1613
QCA+QCB:	72	95	95.4750	0.4750	0.6313
QCA-QCB:	72	45	44.8001	-0.1999	0.4174
QCB+QCC:	72	32	32.1646	0.1646	0.3542
QCB-QCC:	72	18	18.5103	0.5103	0.3380

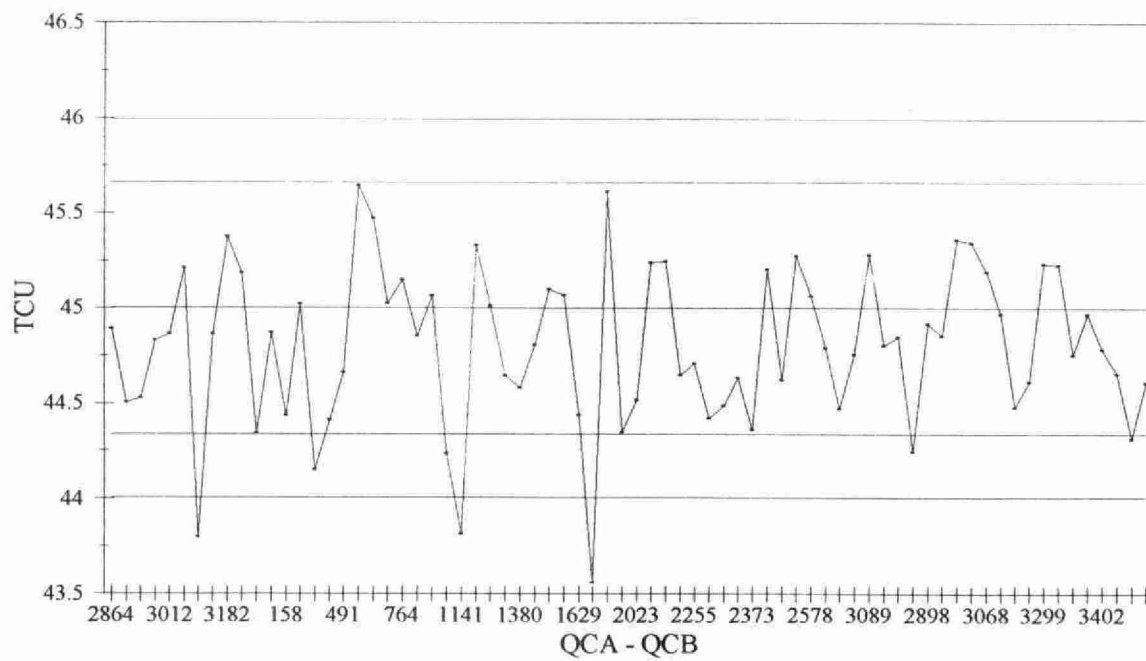
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
93	0 - 16	6.5508	0.2683
45	16 - 40	25.5096	0.9727
30	40 - 80	50.3710	0.8797

Colour
Quality Control Data: 950101 to 951231

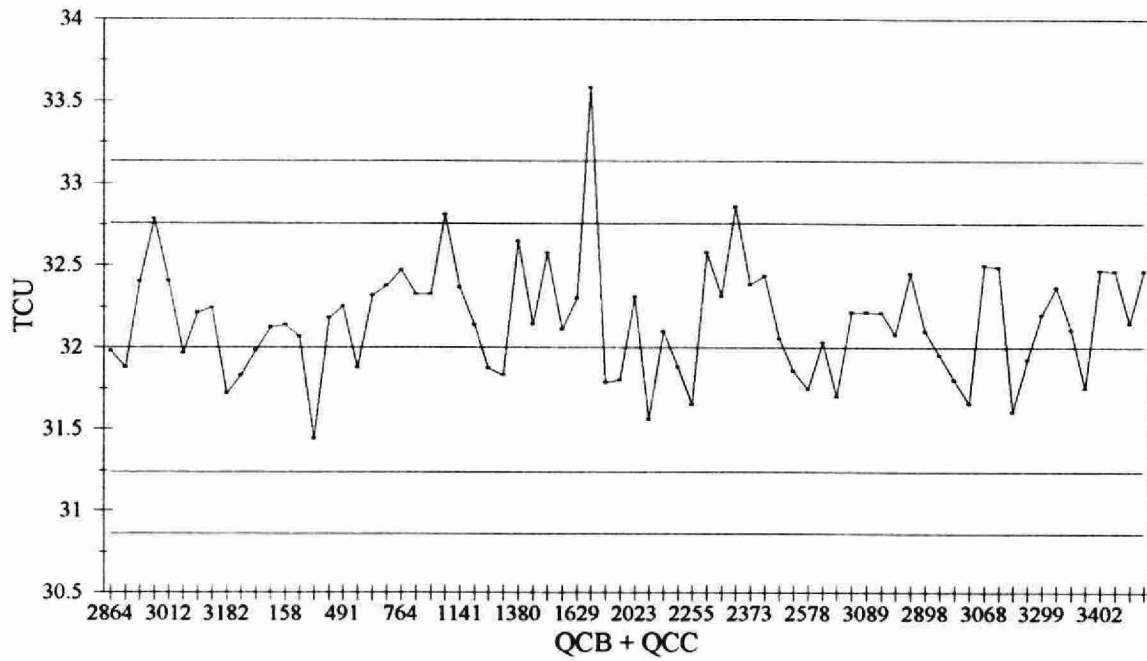


Colour
Quality Control Data: 950101 to 951231



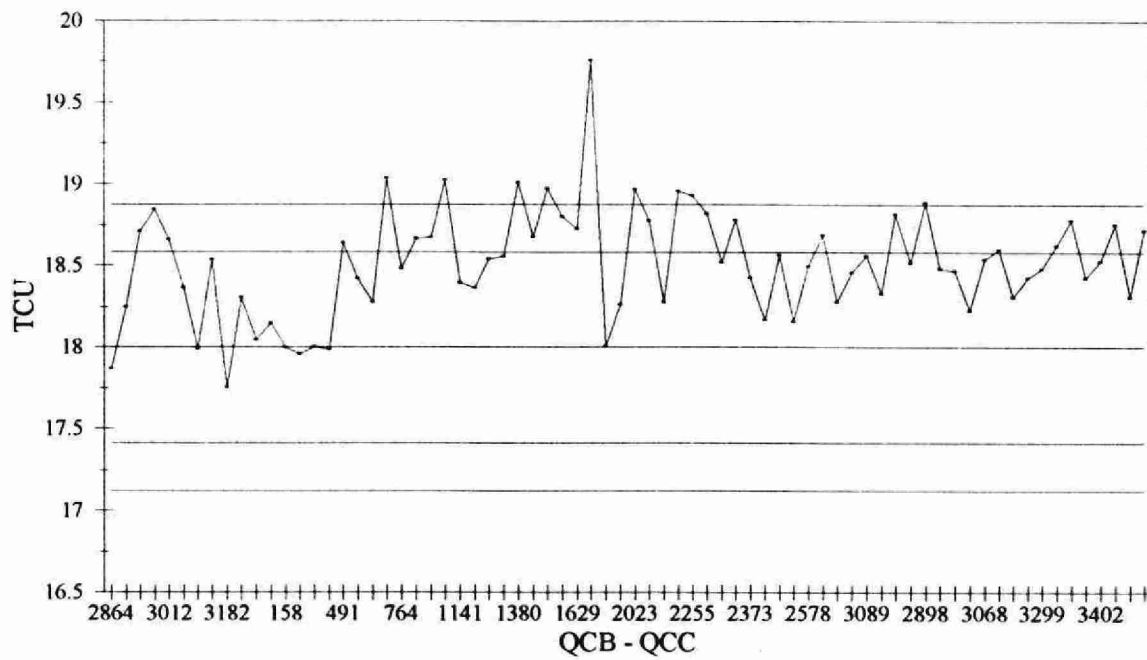
Colour

Quality Control Data: 950101 to 951231



Colour

Quality Control Data: 950101 to 951231



CONDUCTIVITY - METER

IDENTIFICATION:

Method Title: The Determination of Conductivity in Water, Sewage and Industrial Waste by Potentiometry.

Method Number: E6005A

Method Introduced: May, 1977

Current Revision: May 8, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	Conductivity	1 $\mu\text{S/cm}$	5 $\mu\text{S/cm}$

SAMPLE MATRICES:

Sample matrices analyzed are surface water, drinking water, ground water, sewage samples, landfill leachates and industrial effluents.

ANALYTICAL PROCEDURE:

Sample is introduced into a jacketed conductivity cell and equilibrated to 25°C. The conductivity is read directly off the meter.

CONTROLS AND QUALITY ASSURANCE:

Controls: Long Term Blank
Quality Control Solutions A, B and C

Duplicates: 1 for every 10 samples

Reporting: Maximum Significant Figures: Whole Numbers
Units: $\mu\text{S/cm}$

Conductivity - Meter

Quality Control Data from 940101 to 941231

Analytical Range: 2,000 uS/cm

Detection Limit (W): 1 uS/cm

Sw used to calculate control limits -

Sw(A-B): 1.8708

Sw(B-C): 1.4814

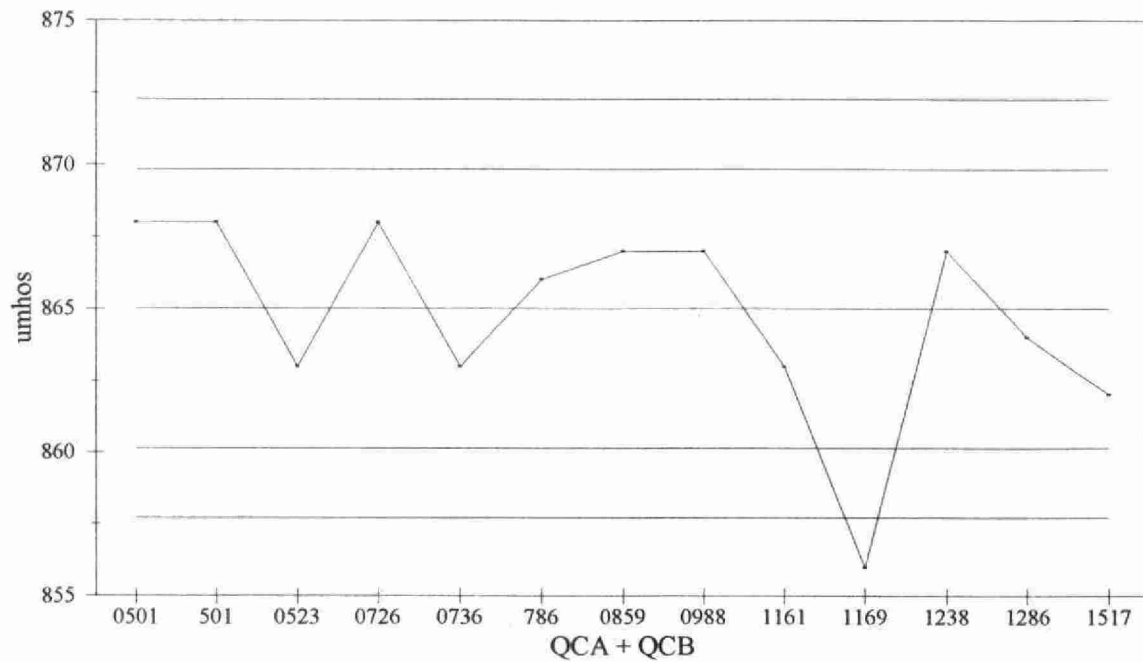
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	13	718	717.0769	-0.9231	2.8712
QCB:	13	147	147.6923	0.6923	1.4367
QCC:	13	74	75.2385	1.2385	0.6640
QCA+QCB:	13	865	864.7692	-0.2308	3.4437
QCA-QCB:	13	571	569.3846	-1.6154	2.9591
QCB+QCC:	13	221	222.9308	1.9308	1.8612
QCB-QCC:	13	73	72.4538	-0.5462	1.2434

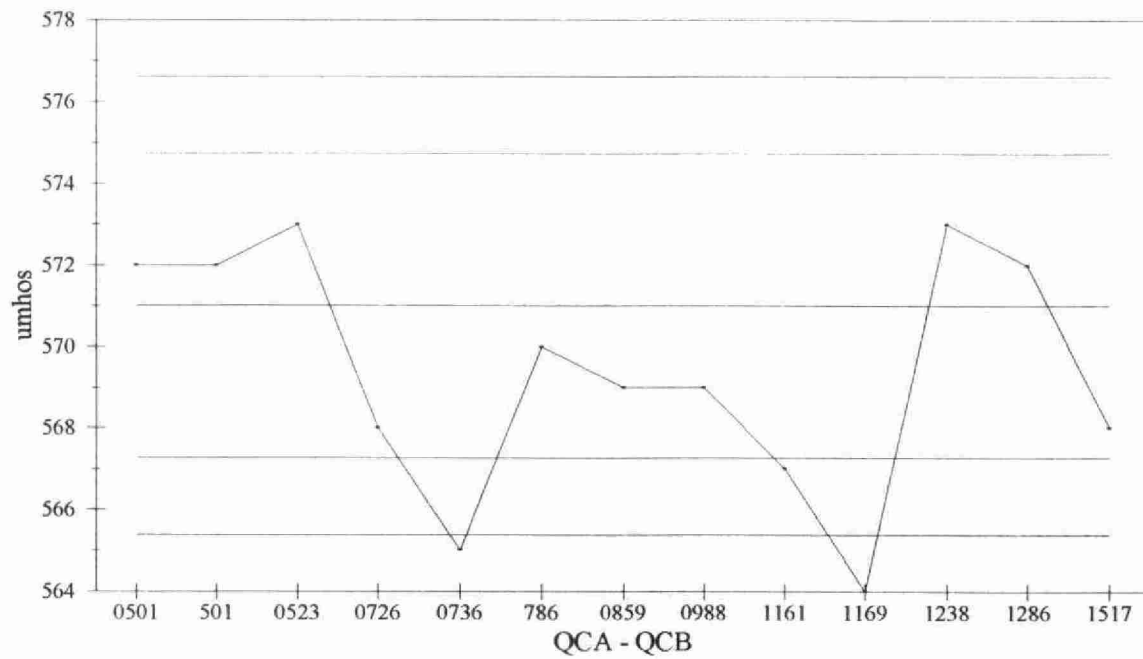
Duplicates: Data from August 1990 to December 1994.

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
22	0 - 400	154.0000	3.4079
20	400 - 1000	722.0000	6.0560
5	1000 - 2000	1305.0000	20.6252

Conductivity - Meter
Quality Control Data: 940101 to 941231

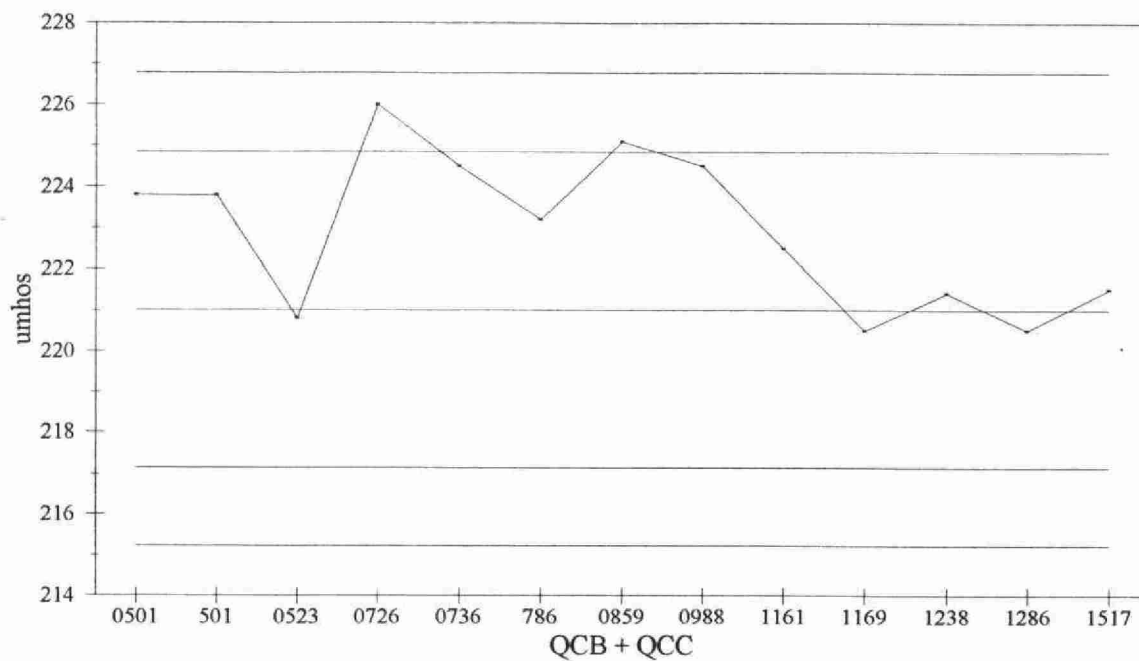


Conductivity - Meter
Quality Control Data: 940101 to 941231



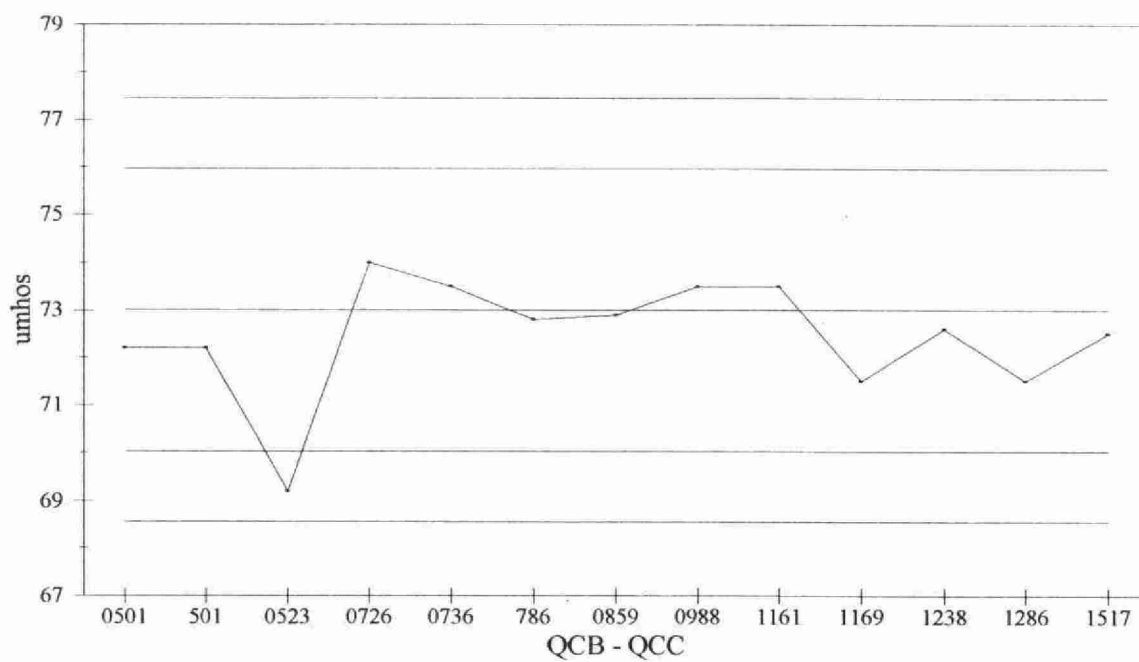
Conductivity - Meter

Quality Control Data: 940101 to 941231



Conductivity - Meter

Quality Control Data: 940101 to 941231



Conductivity - Meter

Quality Control Data from 950101 to 951231

Analytical Range: 2,000 uS/cm

Detection Limit (W): 1 uS/cm

Sw used to calculate control limits -

Sw(A-B): 2.9591

Sw(B-C): 1.2434

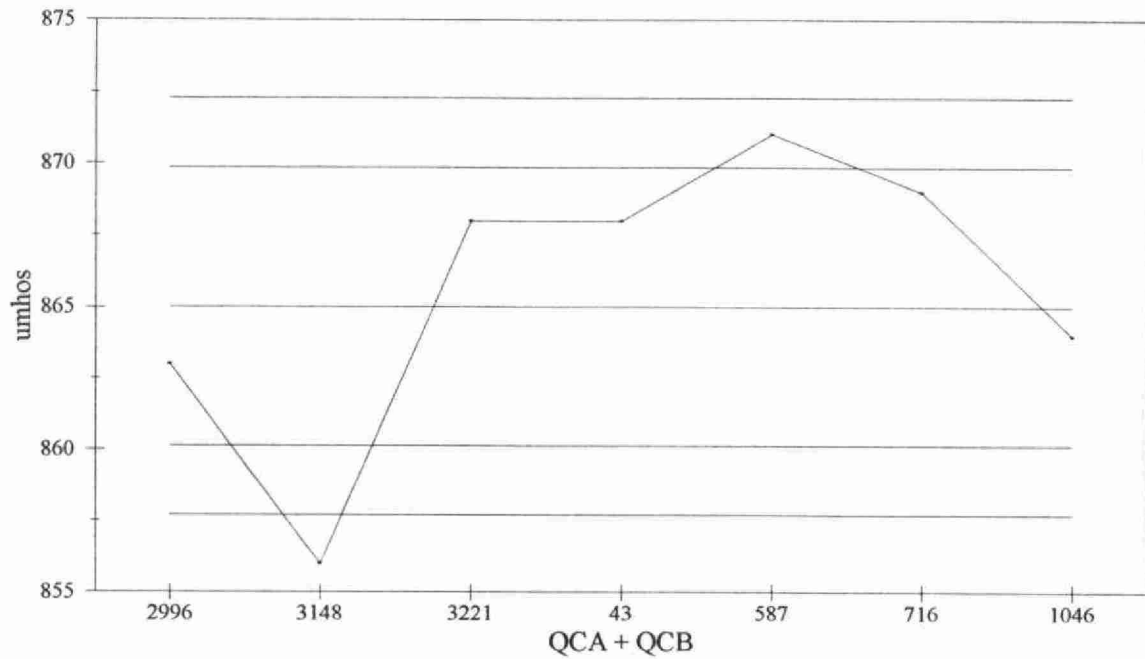
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	7	718	717.5714	-0.4286	4.5774
QCB:	7	147	148.0000	1.0000	0.8165
QCC:	7	74	75.2143	1.2143	0.9063
QCA+QCB:	7	865	865.5714	0.5714	5.0615
QCA-QCB:	7	571	569.5714	-1.4286	4.1975
QCB+QCC:	7	221	223.2143	2.2143	1.6293
QCB-QCC:	7	73	72.7857	-0.2143	0.5669

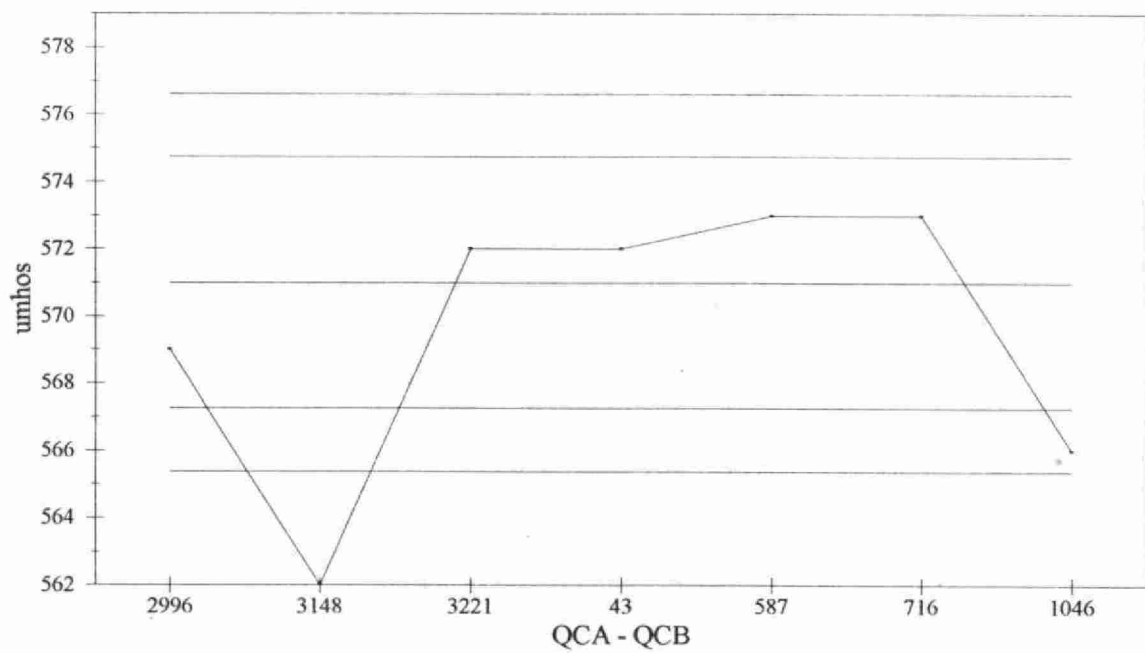
Duplicates: Data from August 1990 to December 1995.

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
22	0 - 400	154.3068	0.9454
21	400 - 1000	720.0476	6.1082
21	1000 - 2000	1568.1900	34.0464

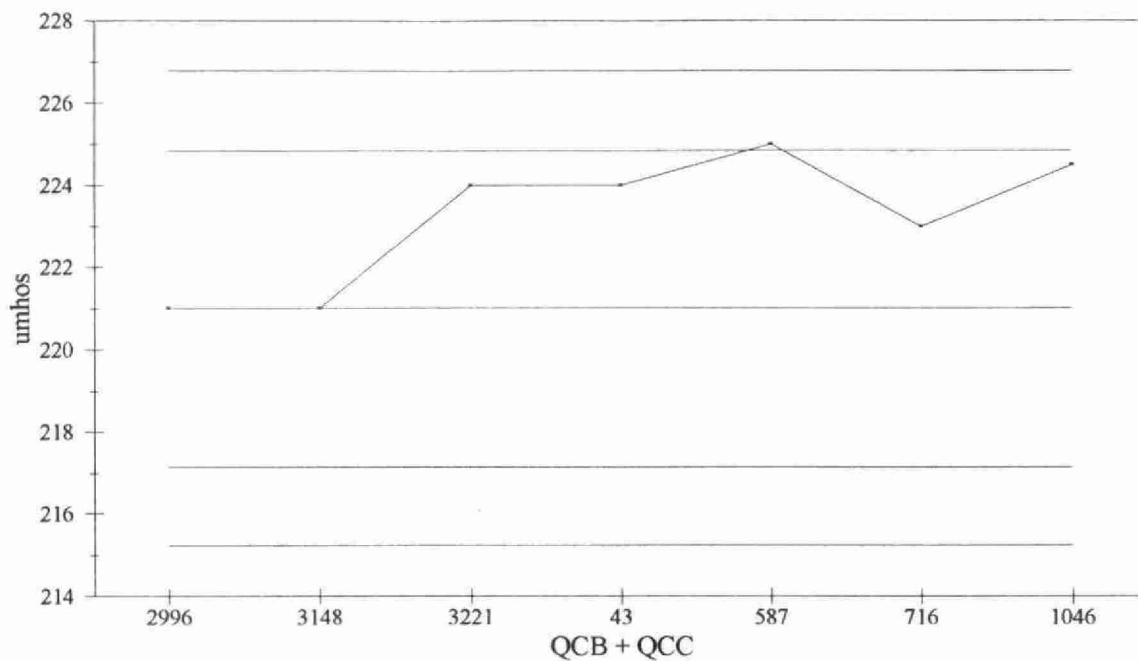
Conductivity - Meter
Quality Control Data: 950101 to 951231



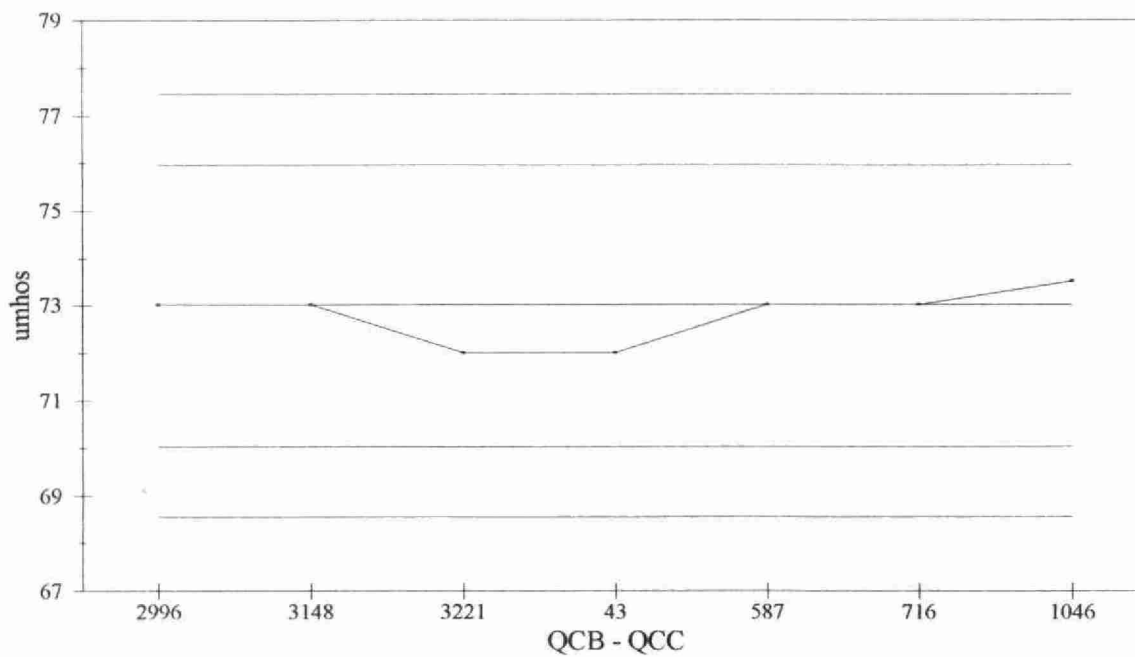
Conductivity - Meter
Quality Control Data: 950101 to 951231



Conductivity - Meter
Quality Control Data: 950101 to 951231



Conductivity - Meter
Quality Control Data: 950101 to 951231



FLUORIDE

IDENTIFICATION:

Method Title: The Determination of Fluoride in Water and Landfill Leachates by Ion Selective Electrode (ISE).

Method Number: E6007A

Method Introduced: 1978

Current Revision: March 2, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	Fluoride	.01 mg/L	.05 mg/L

SAMPLE MATRICES:

Sample matrices analyzed are surface water, domestic water, precipitation and landfill leachates.

ANALYTICAL PROCEDURE:

Fluoride is determined by an ion specific electrode. Any complexed fluoride in the sample is dissociated by the addition of a Total Ionic Strength Adjustment Buffer (TISAB).

CONTROLS AND QUALITY ASSURANCE:

Controls: Long Term Blank
Quality Control Solutions A and B

Drift: Sensitivity Checks after every 20 samples

Duplicates: 1 for every 15 samples

Interlabs: CAEAL Certified
Ontario Ministry of the Environment and Energy Performance Evaluation Study
LRTAP and GLAP participant

Reporting: Maximum Significant Figures: 2
Units: mg/L as F

Fluoride

Quality Control Data from 940101 to 941231

Analytical Range: 2.0 mg/L

Detection Limit (W): .01 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0364

Control Samples:

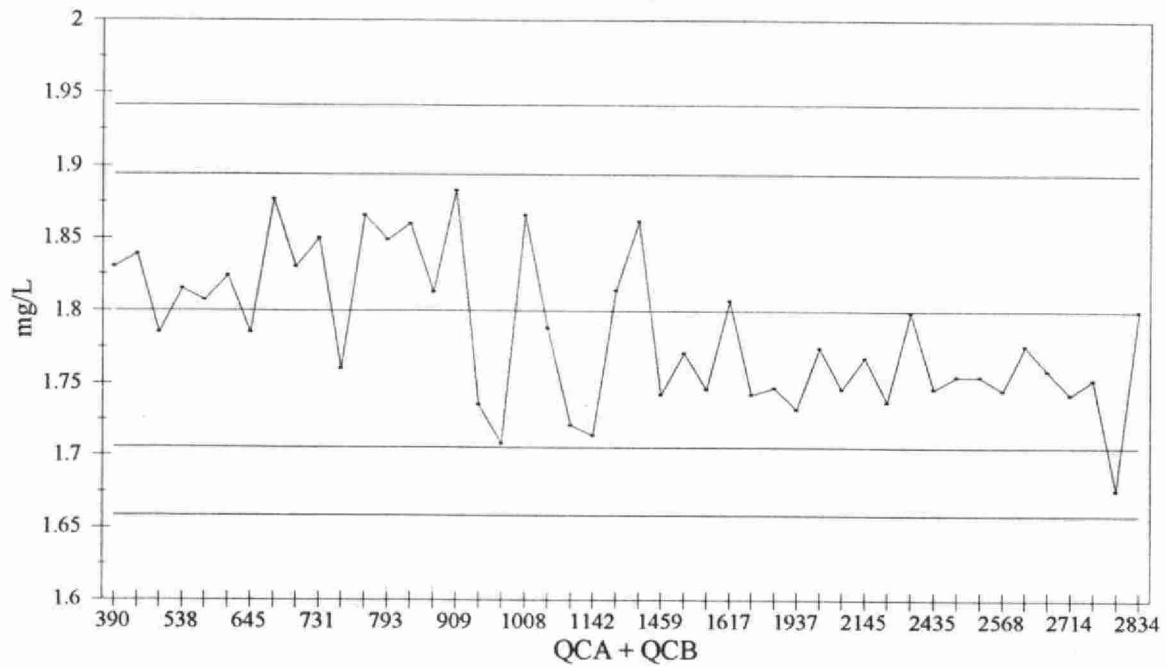
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	46	1.4	1.3971	-0.0029	0.0350
QCB:	46	0.4	0.3877	-0.0123	0.0189
QCA+QCB:	46	1.8	1.7848	-0.0152	0.0508
QCA-QCB:	46	1	1.0095	0.0095	0.0243

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
91	0 - 0.4	0.1330	0.0203
18	0.4 - 1.0	0.6820	0.0375
10	1.0 - 2.0	1.3510	0.0449

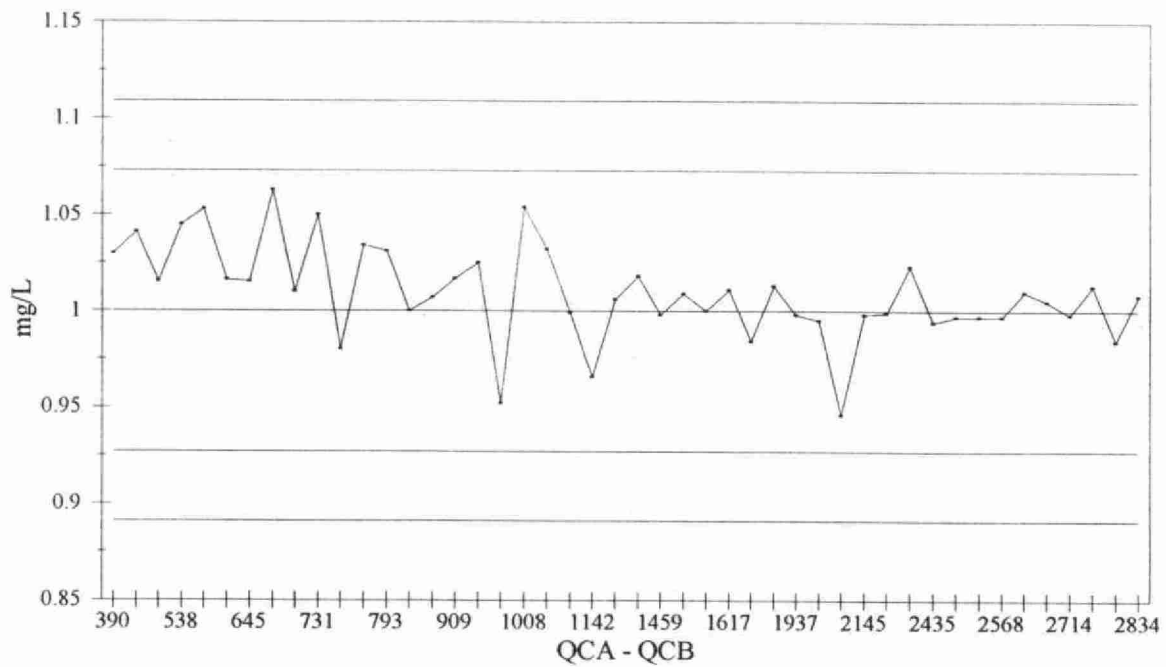
Fluoride

Quality Control Data: 940101 to 941231



Fluoride

Quality Control Data: 940101 to 941231



Fluoride

Quality Control Data from 950101 to 951231

Analytical Range: 2.0 mg/L

Detection Limit (W): .01 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0243

Control Samples:

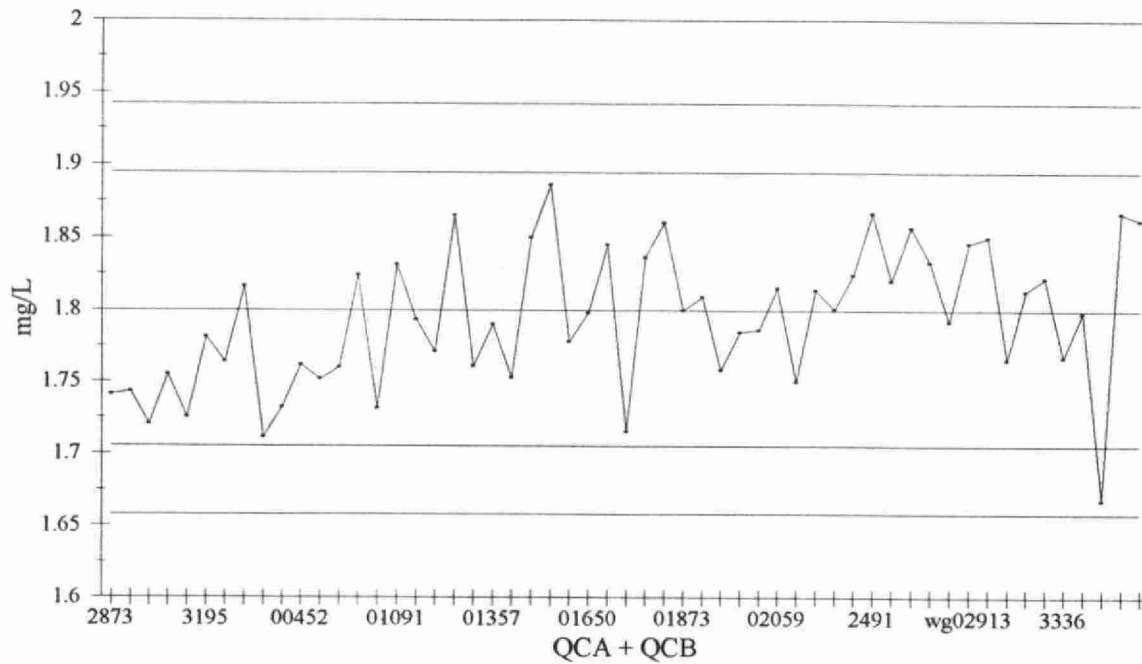
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	55	1.4	1.4045	0.0045	0.0313
QCB:	55	0.4	0.3885	-0.0115	0.0203
QCA+QCB:	55	1.8	1.7931	-0.0069	0.0483
QCA-QCB:	55	1	1.0160	0.0160	0.0212

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
117	0 - 0.4	0.0908	0.0176
23	0.4 - 1.0	0.7646	0.0448
13	1.0 - 2.0	1.3374	0.0482

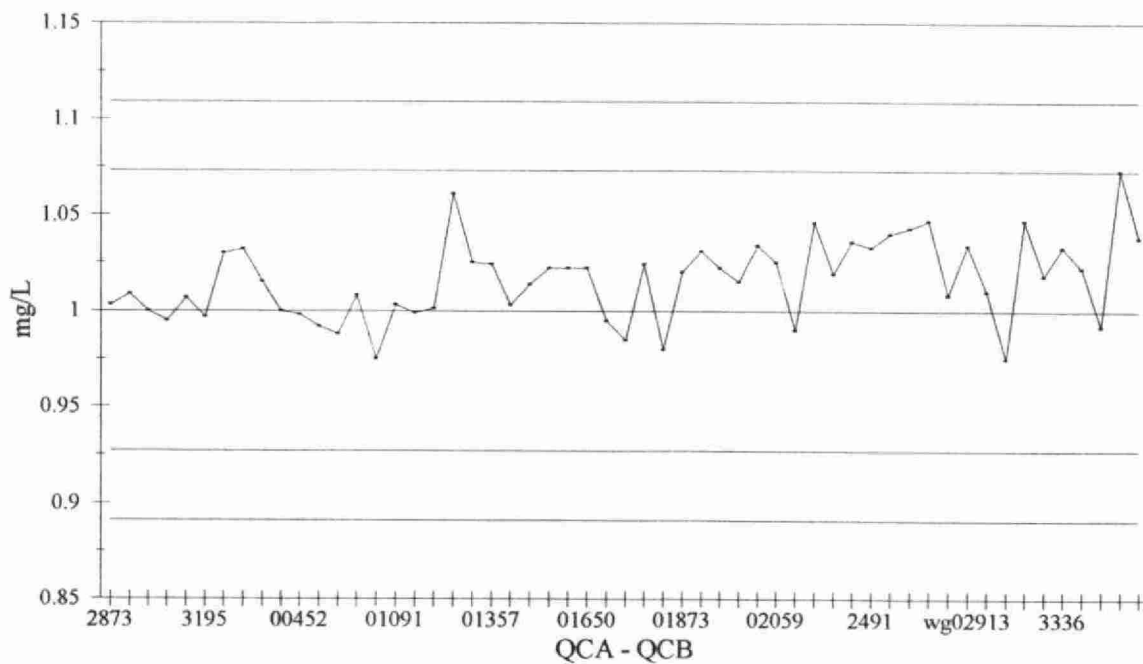
Fluoride

Quality Control Data: 950101 to 951231



Fluoride

Quality Control Data: 950101 to 951231



IRON - COLOURMETRIC

IDENTIFICATION:

Method Title: The Determination of Iron in Water by Spectrophotometry.

Method Number: E6006A

Method Introduced: May, 1978

Current Revision: May 8, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	Iron	.01 mg/L	.05 mg/L

SAMPLE MATRICES:

Samples analyzed are surface water, domestic water, ground water and industrial effluents.

ANALYTICAL PROCEDURE:

An aliquot of sample, usually 50 mls is mixed with an acidified hydroxylamine hydrochloride solution and concentrated. Ortho-phenanthroline and a buffer are added causing a colour development. The coloured solution formed obeys Beer's Law and its intensity is measured using a spectrophotometer.

CONTROLS AND QUALITY ASSURANCE:

Controls: Long Term Blank
2 Digested Blanks
Quality Control Solutions A, B and C

Drift: 100 %T check DDW
ZERO %T check every 10 samples

Duplicates: 1 for every 10 samples

Reporting: Maximum Significant Figures: 2
Units: mg/L as Fe

Iron - Colour

Quality Control Data from 940101 to 941231

Analytical Range: 2.0 mg/L

Detection Limit (W): .01 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0195

Control Samples:

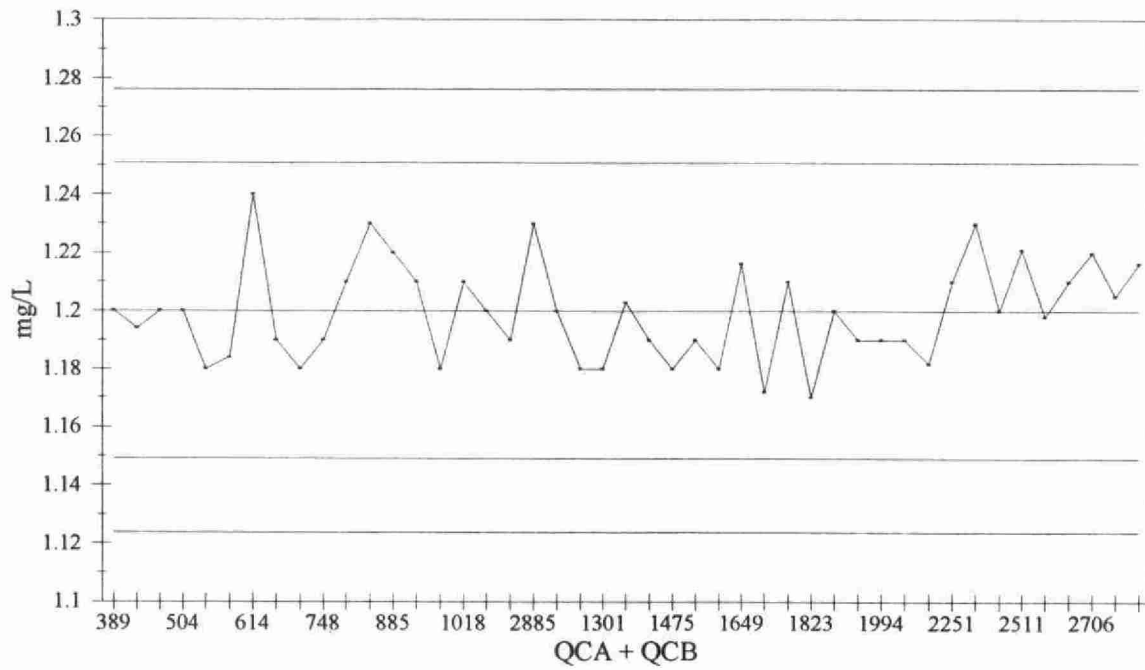
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	45	1	1.0064	0.0064	0.0131
QCB:	45	0.2	0.1929	-0.0071	0.0087
QCA+QCB:	45	1.2	1.1994	-0.0006	0.0169
QCA-QCB:	45	0.8	0.8135	0.0135	0.0146

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
84	0 - 0.4	0.0920	0.0068
11	0.4 - 1.0	0.6690	0.0161
2	1.0 - 2.0	1.6650	0.0290

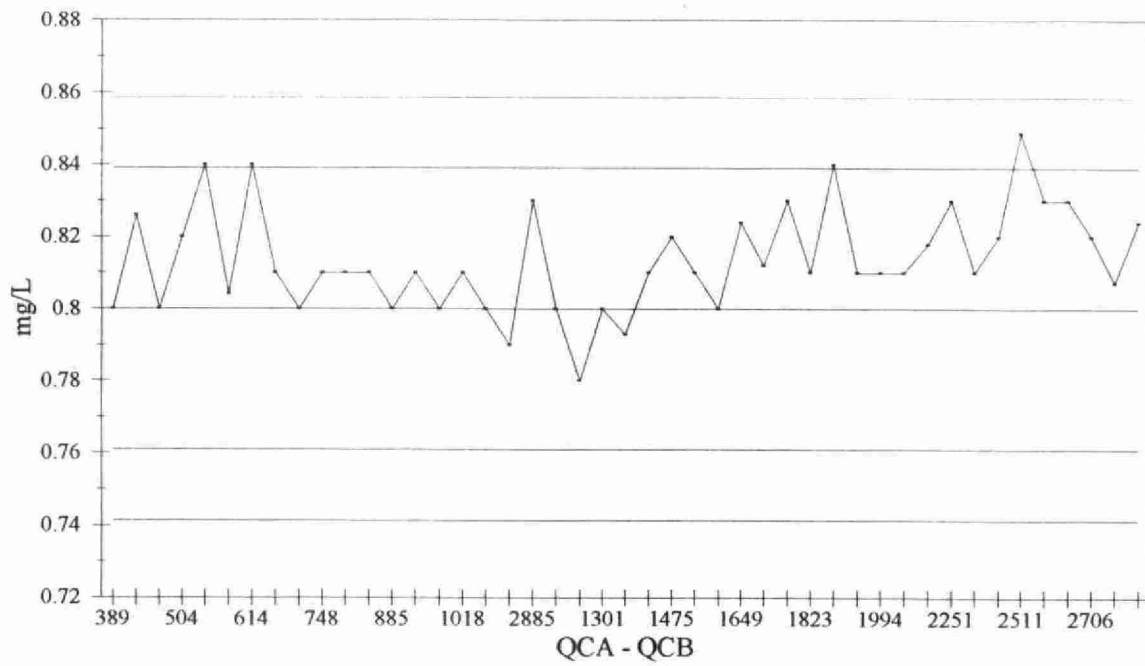
Iron - Colour

Quality Control Data: 940101 to 941231



Iron - Colour

Quality Control Data: 940101 to 941231



Iron - Colour

Quality Control Data from 950101 to 951231

Analytical Range: 2.0 mg/L

Detection Limit (W): .01 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0146

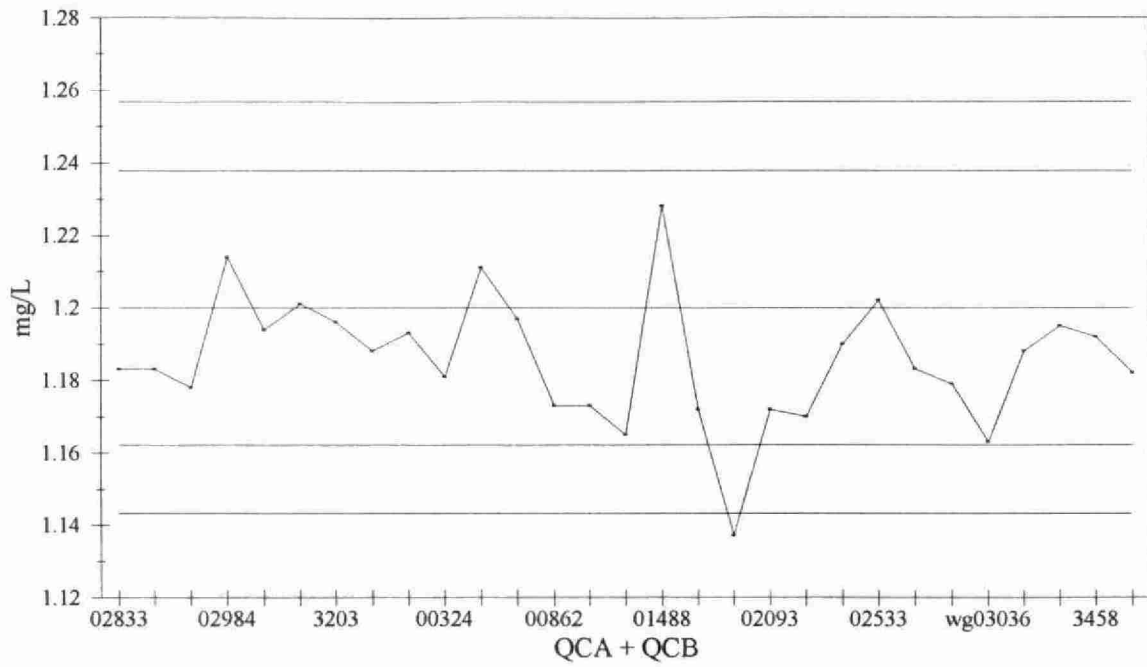
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	29	1	0.9950	-0.0050	0.0175
QCB:	29	0.2	0.1906	-0.0094	0.0105
QCA+QCB:	29	1.2	1.1856	-0.0144	0.0176
QCA-QCB:	29	0.8	0.8044	0.0044	0.0230

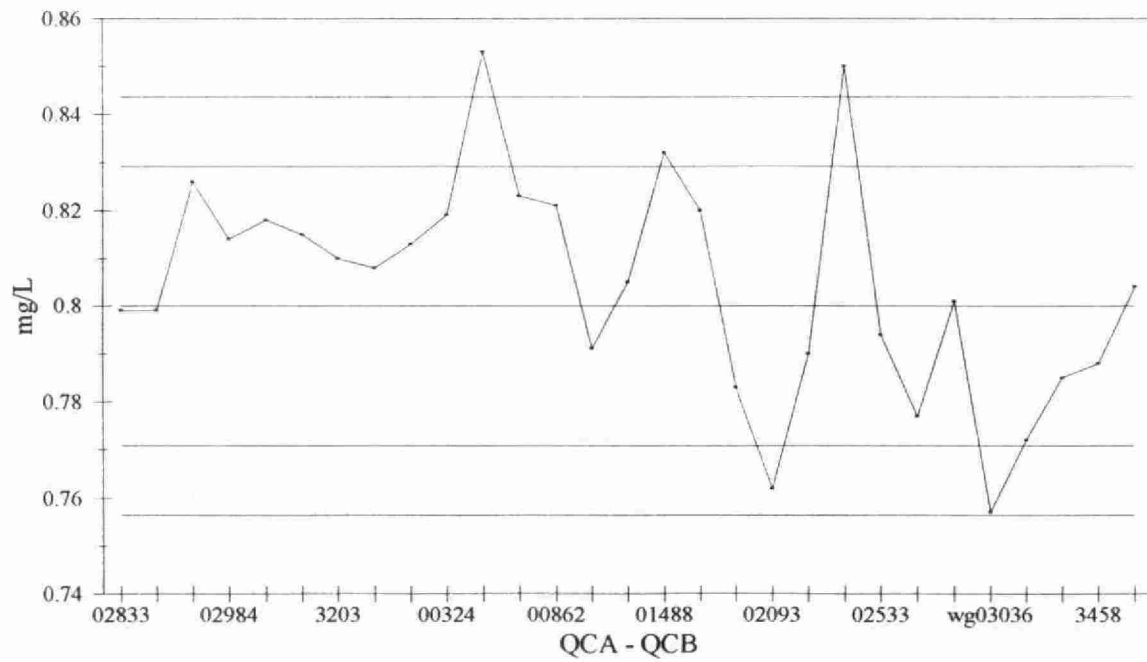
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
56	0 - 0.4	0.0936	0.0100
7	0.4 - 1.0	0.7564	0.0098
6	1.0 - 2.0	1.5542	0.0430

Iron - Colour Quality Control Data: 950101 to 951231



Iron - Colour Quality Control Data: 950101 to 951231



pH-BOD

IDENTIFICATION:

Method Title: The Determination of pH in Water, Sewage and Industrial Waste by Potentiometry.

Method Number: E6009A

Method Introduced: May, 1977

Current Revision: April 24, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	pH	n/a	n/a

SAMPLE MATRICES:

Sample matrices analyzed are surface waters, drinking water, ground water, sewage effluents, industrial wastes and precipitation samples.

ANALYTICAL PROCEDURE:

pH is measured directly on a stirred sample using a hydrogen ion sensitive glass combination electrode. The meter is calibrated in pH units against buffers of known pH.

CONTROLS AND QUALITY ASSURANCE:

Controls: Quality Control Solutions A and B

Duplicates: 1 for every 10 samples

Reporting: Maximum Significant Figures: 2
Units: unitless

pH - BOD**Quality Control Data from 940101 to 941231**

Analytical Range: 0-14

Detection Limit (W):

n/a

Sw used to calculate control limits -

Sw(A-B):

0.0230

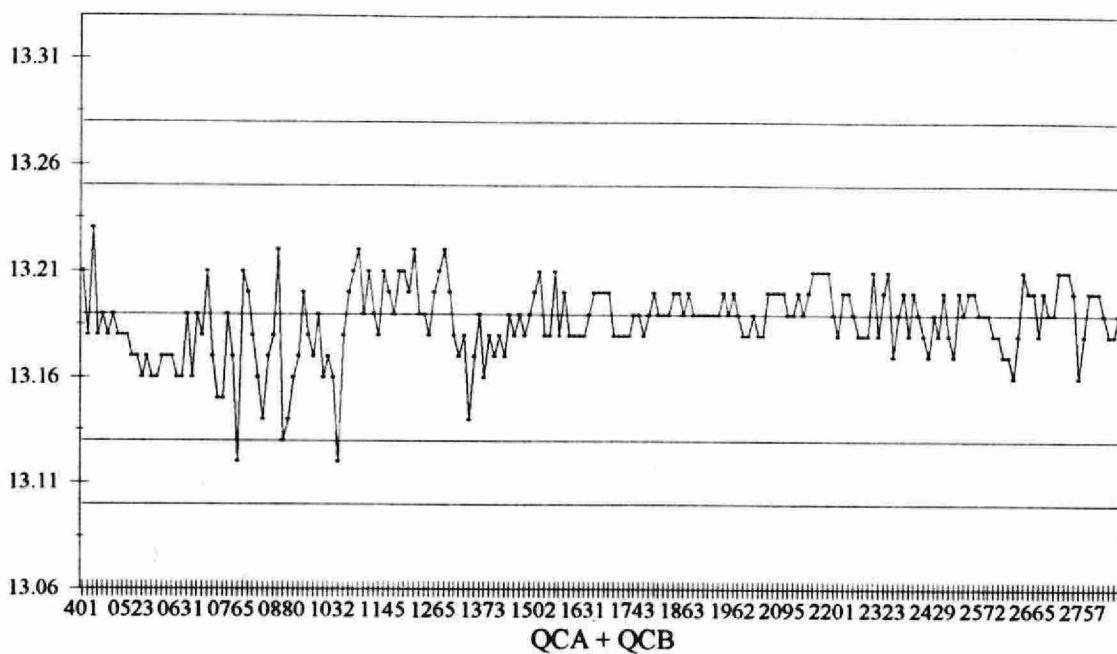
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	209	9.18	9.1761	-0.0039	0.0171
QCB:	209	4.01	4.0102	0.0002	0.0037
QCA+QCB:	209	13.19	13.1863	-0.0037	0.0176
QCA-QCB:	209	5.17	5.1658	-0.0042	0.0175

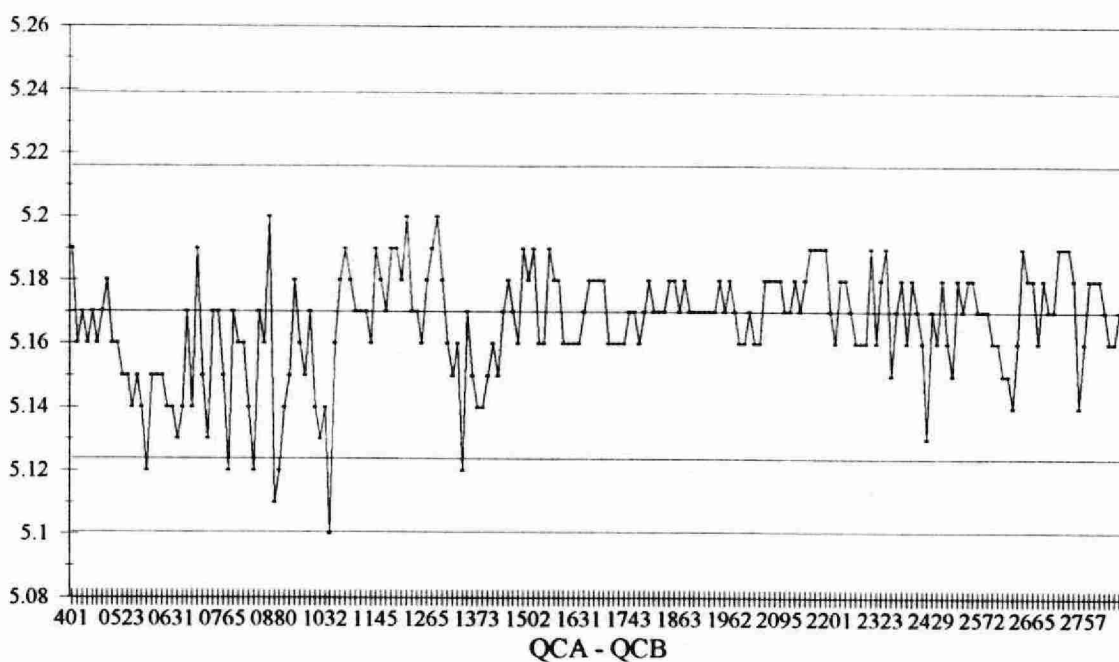
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
7	5.0 - 5.8	5.4430	0.0305
59	5.8 - 7.0	6.5360	0.0188
202	7.0 - 9.0	7.5540	0.0244

pH - BOD
Quality Control Data: 940101 to 941231



pH - BOD
Quality Control Data: 940101 to 941231



pH - BOD

Quality Control Data from 950101 to 951231

Analytical Range: 0-14

Detection Limit (W):

n/a

Sw used to calculate control limits -

Sw(A-B):

0.0175

Control Samples:

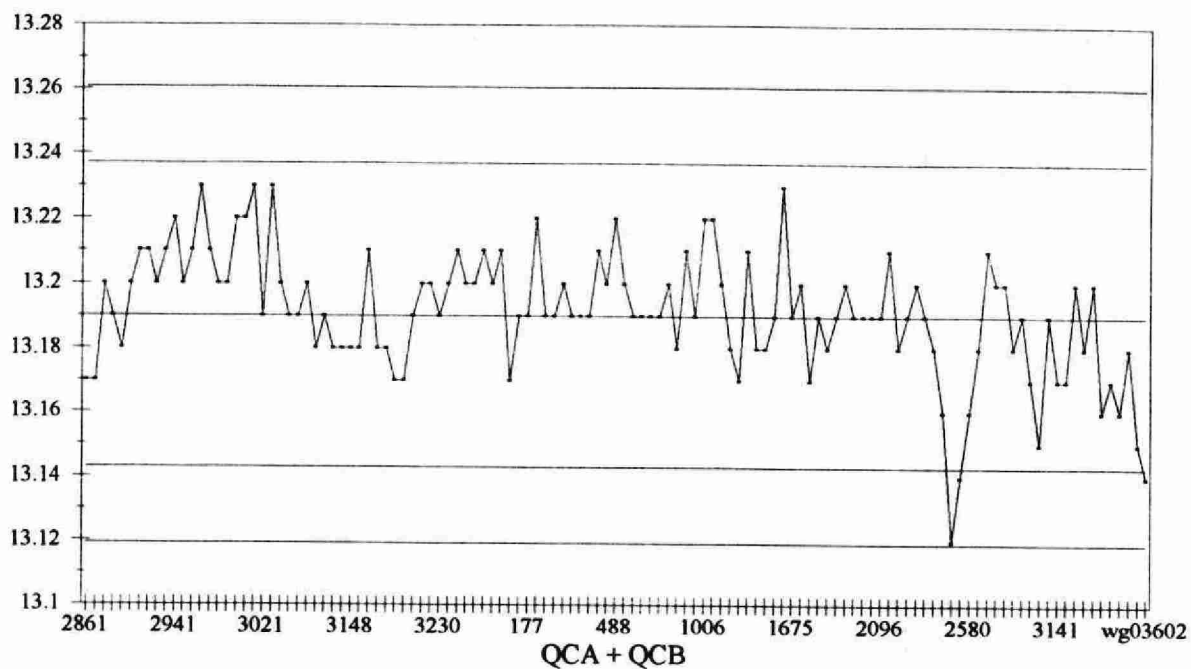
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	121	9.18	9.1814	0.0014	0.0185
QCB:	121	4.01	4.0097	-0.0003	0.0022
QCA+QCB:	121	13.19	13.1911	0.0011	0.0191
QCA-QCB:	121	5.17	5.1717	0.0017	0.0182

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
11	5.0 - 5.8	5.5509	0.0126
52	5.8 - 7.0	6.5200	0.0182
149	7.0 - 9.0	7.5807	0.2036

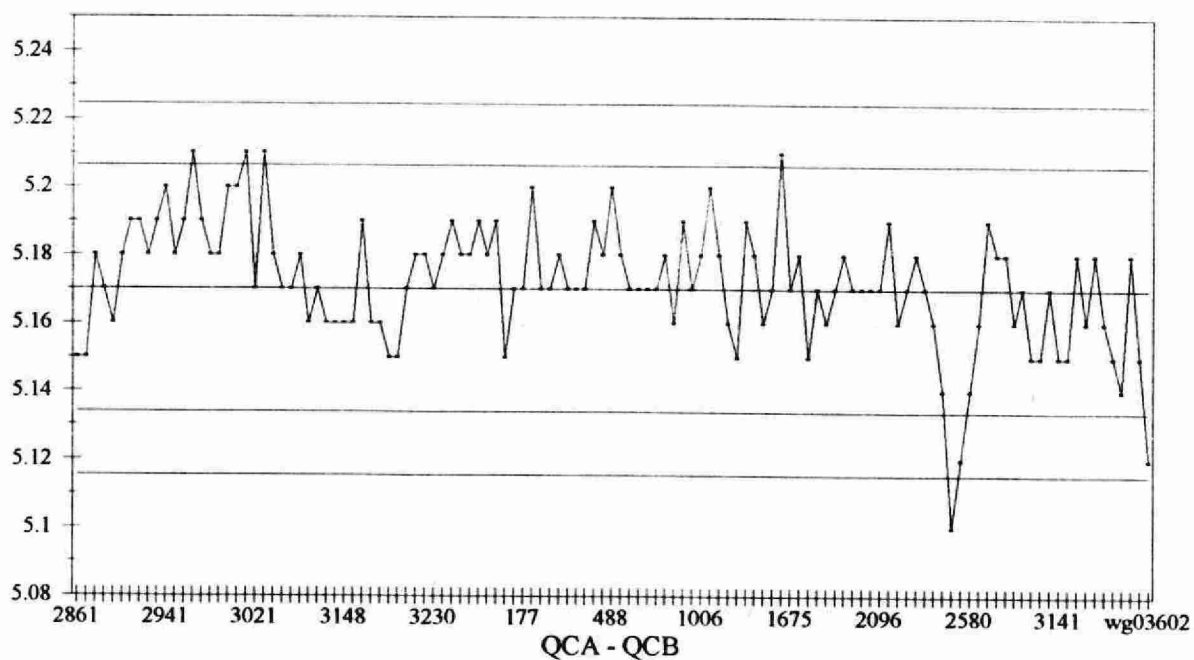
pH - BOD

Quality Control Data: 950101 to 951231



pH - BOD

Quality Control Data: 950101 to 951231



SILICON - MOLYBDATE REACTIVE SILICATES

IDENTIFICATION:

Method Title: The Determination of Molybdate Reactive Silicates in Water, Sewage, Leachates and Precipitation by Colourimetry.

Method Number: E6025A

Method Introduced: January, 1978

Current Revision: January 1, 1995

PARAMETER:	Parameter Name	W(units)	T(units)
	Molybdate Reactive Silicates	.02 mg/L	.10 mg/L

SAMPLE MATRICES:

Sample matrices analyzed are surface waters, domestic waters, leachates and industrial effluents.

ANALYTICAL PROCEDURE:

Reactive silicates are determined by the formation of a reduced molybdo-silicate complex at pH 1.2. Ascorbic acid is the reducing agent. Oxalic acid suppresses phosphate interference.

CONTROLS AND QUALITY ASSURANCE:

Controls: Long Term Blank
Quality Control Solutions A and B

Drift: Blank after every 10 samples
Sensitivity Checks after every 20 samples

Duplicates: 1 for every 10 samples

Interlabs: CAEAL Certified
Ontario Ministry of the Environment and Energy Performance Evaluation Study
LRTAP and GLAP participant

Reporting: Maximum Significant Figures: 2
Units: mg/L as Si

Silicate

Quality Control Data from 940101 to 941231

Analytical Range: 3.0 mg/L

Detection Limit (W): 0.02 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0183

Control Samples:

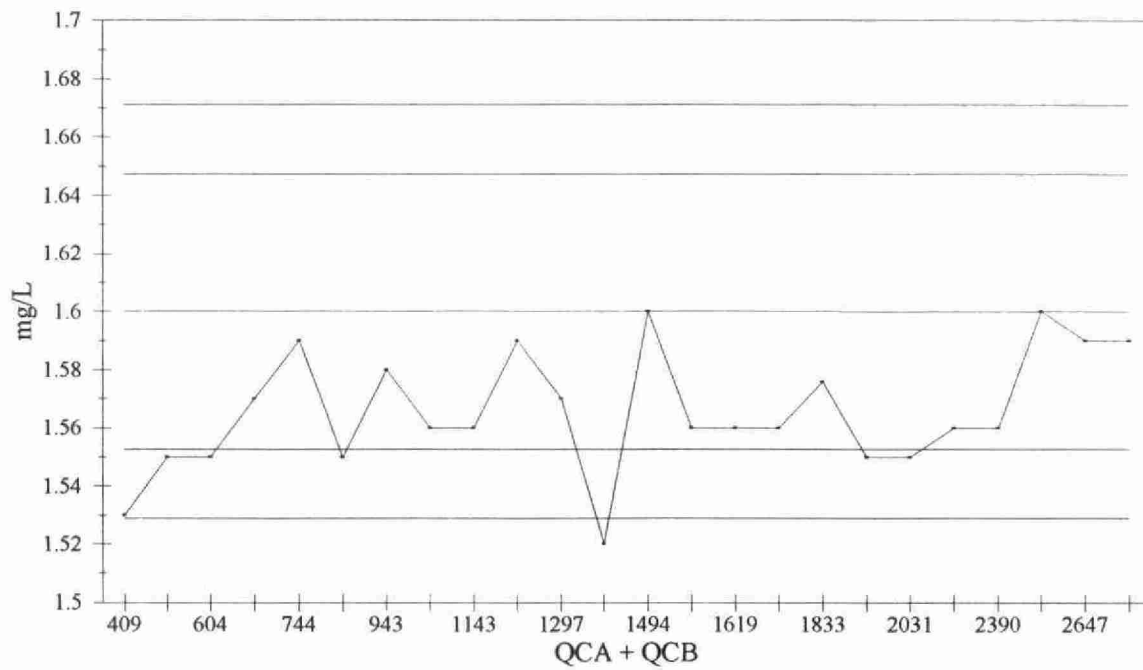
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	24	1.4	1.3712	-0.0288	0.0142
QCB:	24	0.2	0.1945	-0.0055	0.0101
QCA+QCB:	24	1.6	1.5657	-0.0342	0.0207
QCA-QCB:	24	1.2	1.1768	-0.0232	0.0132

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
8	0.0 - 0.6	0.3640	0.0096
22	0.6 - 1.5	1.0890	0.0271
20	1.5 - 3.0	1.7750	0.0344

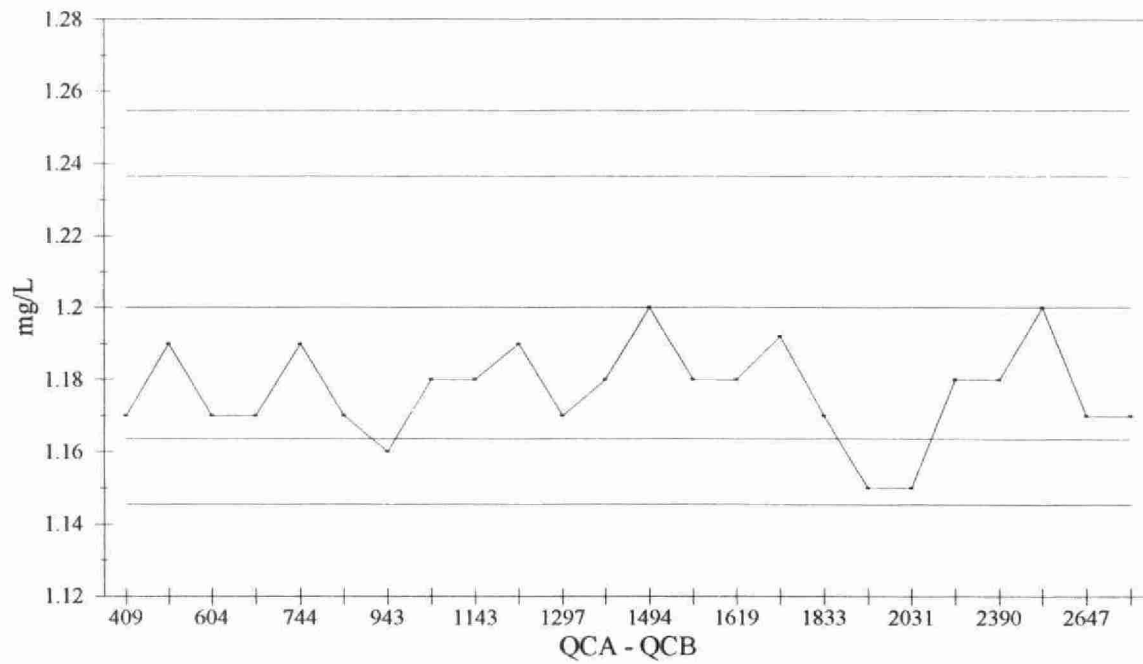
Silicate

Quality Control Data: 940101 to 941231



Silicate

Quality Control Data: 940101 to 941231



Silicate

Quality Control Data from 950101 to 951231

Analytical Range: 3.0 mg/L

Detection Limit (W): 0.02 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0132

Control Samples:

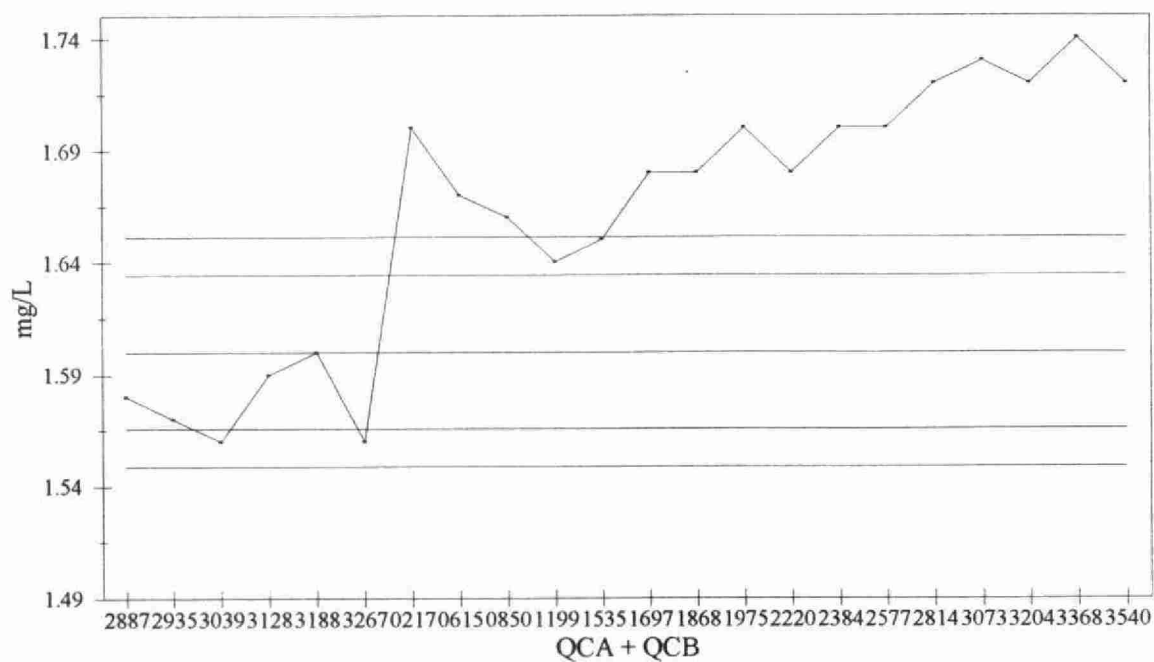
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	22	1.4	1.4432	0.0432	0.0487
QCB:	22	0.2	0.2182	0.0182	0.0130
QCA+QCB:	22	1.6	1.6614	0.0614	0.0591
QCA-QCB:	22	1.2	1.2250	0.0250	0.0400

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
7	0.0 - 0.6	0.1710	0.0011
23	0.6 - 1.5	1.1260	0.0142
10	1.5 - 3.0	1.8470	0.0176

Silicate

Quality Control Data: 950101 to 951231



Silicate

Quality Control Data: 950101 to 951231



SOLIDS - TOTAL, SUSPENDED AND DISSOLVED

IDENTIFICATION:

Method Title: The Determination of Dissolved Solids, Particulate (Suspended) Solids and Total Solids in Water, Rivers, Sewage, Landfill and Industrial Effluents by Gravimetry.

Method Number: E6035A

Method Introduced: 1980

Current Revision: April 27, 1995

PARAMETER:	Parameter Name	W(units)	T(units)
	Total Solids	5.0 mg/L	25.0 mg/L
	Suspended Solids	1.0 mg/L	5.0 mg/L
	Dissolved Solids	5.0 mg/L	25.0 mg/L

SAMPLE MATRICES:

Sample matrices analyzed are sewages, surface waters, precipitation, industrial effluents and landfill leachates.

ANALYTICAL PROCEDURE:

Total Solids: A well mixed sample is evaporated in a pre-weighed dish and dried to a constant weight in an oven set at $103^{\circ}\text{C} \pm 2^{\circ}\text{C}$. The increase in weight over that of the empty dish represents the total solids.

Suspended Solids: An aliquot of sample (50-500 mL) is vacuum filtered through a pre-weighed Whatman 934 AH glass fibre filter paper. The residue is dried at $103^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and the particulate solids are determined gravimetrically.

Dissolved Solids: A volume of sample is vacuum filtered through a pre-washed glass fibre filter; a 50 mL aliquot of filtrate is evaporated in a pre-weighed ceramic dish overnight at $103^{\circ}\text{C} \pm 2^{\circ}\text{C}$. The increase in weight over that of the empty dish represents the dissolved solids.

CONTROLS AND QUALITY ASSURANCE:

Controls: 2 S class weights

Drift: Balance zero after every 5 weighings
Daily blank, Empty dishes (C1, C2)

Recovery: Long Term Blank
REC1 (2 sets), REC2 (2 sets)

Duplicates: 1 for every 10 samples

Interlabs: CAEAL Certified
Ontario Ministry of the Environment and Energy Performance Evaluation Study
LRTAP and GLAP participant

Reporting: Maximum Significant Figures: 2
Units: mg/L

Total Solids

Quality Control Data from 940101 to 941231

Analytical Range: 2000 mg/L

Detection Limit (W): 5.0 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.00003

Control Samples:

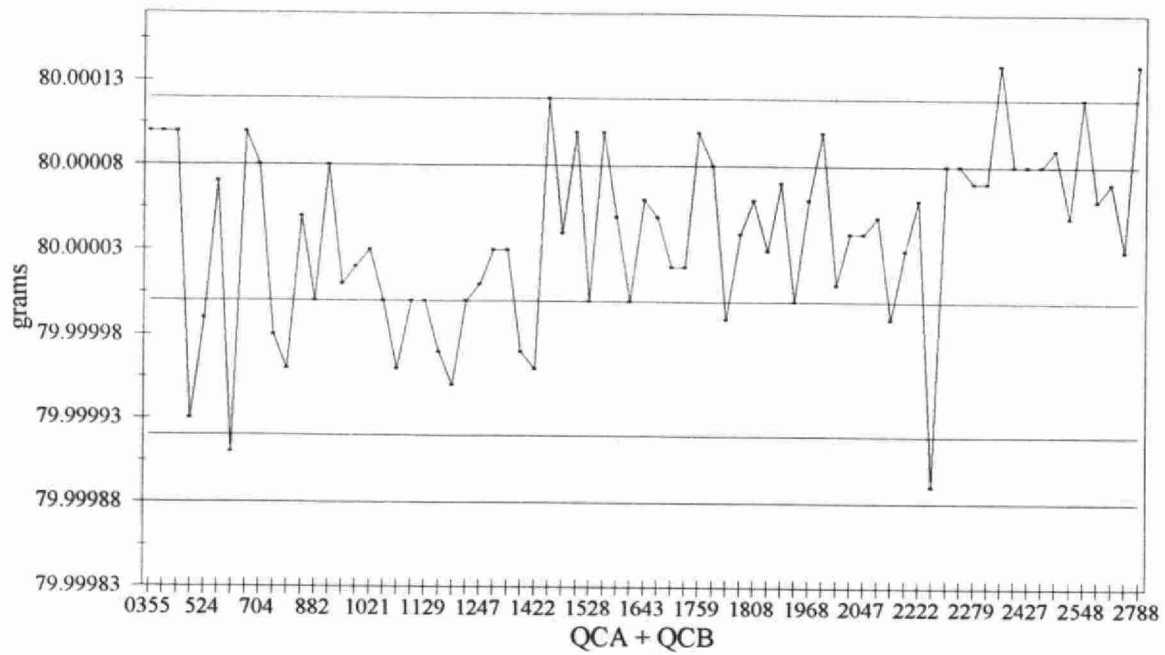
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	73	50.00003	50.00005	0.00002	0.00003
QCB:	73	29.99997	29.99998	0.00001	0.00003
QCA+QCB:	73	80.00000	80.00004	0.00004	0.00005
QCA-QCB:	73	20.00006	20.00007	0.00001	0.00003

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
175	0 - 400	125.66000	4.86856
28	400 - 1000	559.14000	11.22259
18	1000 - 2000	1338.44000	13.83233

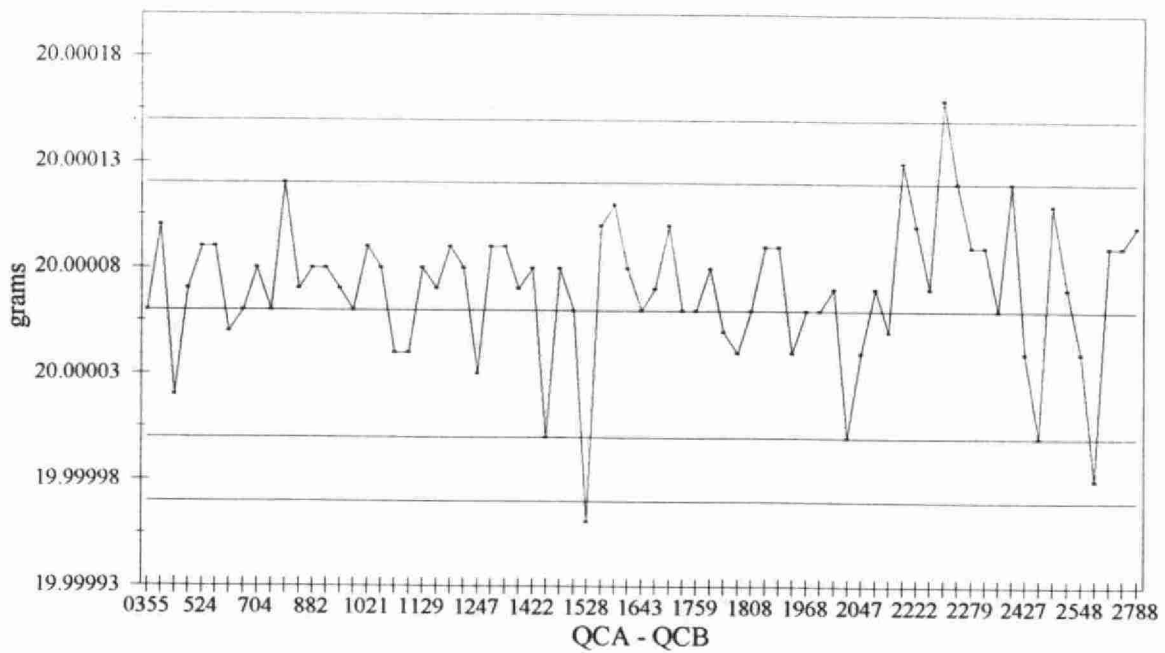
Total Solids

Quality Control Data: 940101 to 941231



Total Solids

Quality Control Data: 940101 to 941231



Total Solids

Quality Control Data from 950101 to 951231

Analytical Range: 2000 mg/L

Detection Limit (W): 5.0 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.00003

Control Samples:

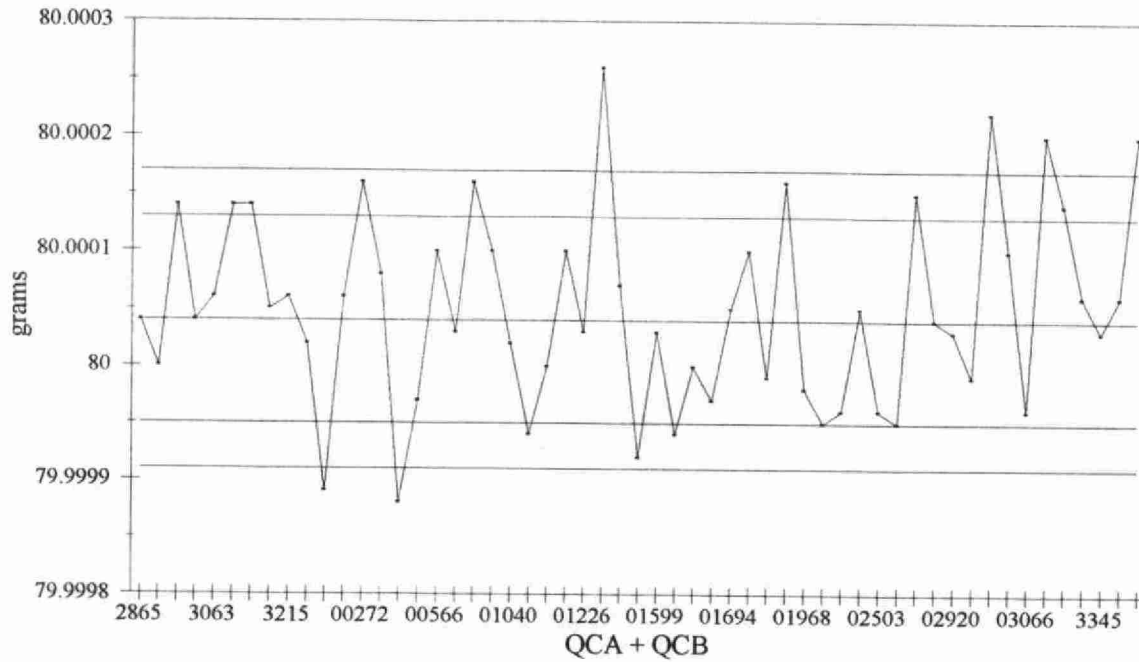
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	55	50.00003	50.00007	0.00004	0.00005
QCB:	55	29.99997	29.99998	0.00001	0.00004
QCA+QCB:	55	80.00000	80.00005	0.00005	0.00008
QCA-QCB:	55	20.00006	20.00008	0.00002	0.00004

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
84	0 - 400	127.73570	2.88590
22	400 - 1000	654.45450	22.60782
11	1000 - 2000	1271.18200	41.90465

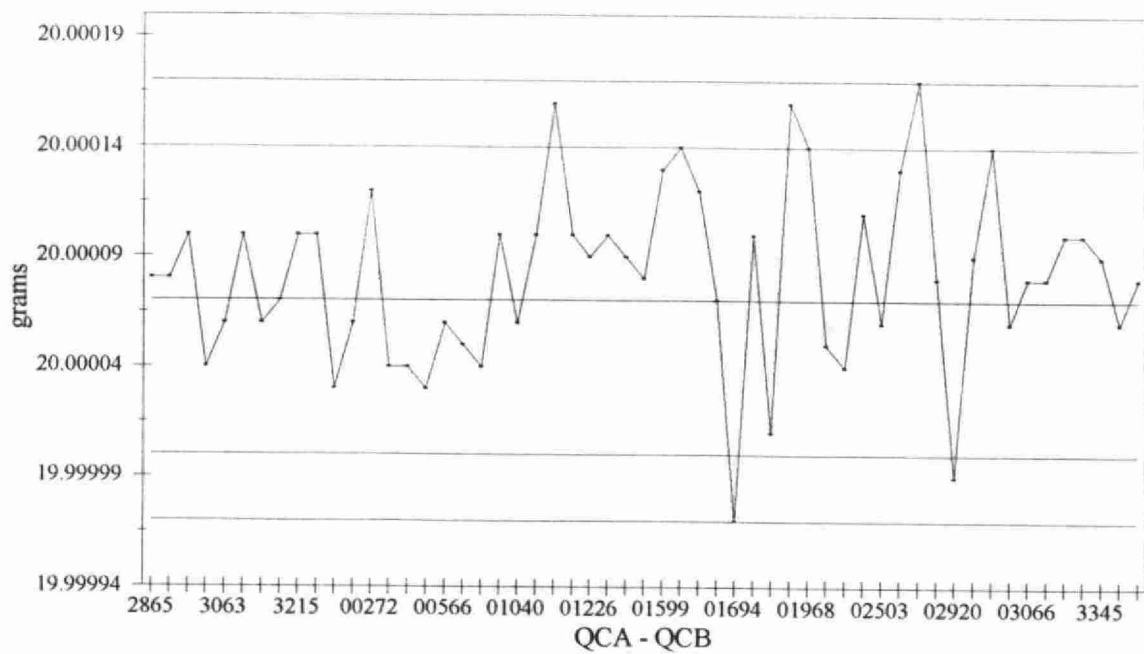
Total Solids

Quality Control Data: 950101 to 951231



Total Solids

Quality Control Data: 950101 to 951231



Suspended Solids

Quality Control Data from 940101 to 941231

Analytical Range: 200 mg/L

Detection Limit (W): 1.0 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.00002

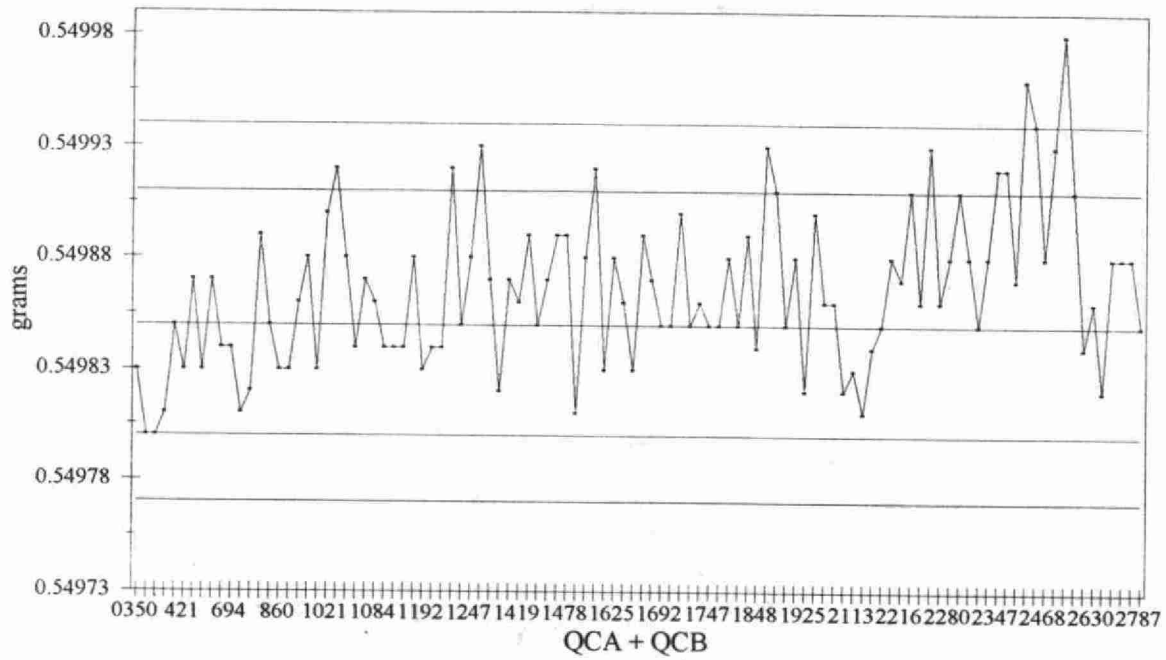
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	106	0.49991	0.49992	0.00001	0.00002
QCB:	106	0.04994	0.04995	0.00001	0.00003
QCA+QCB:	106	0.54985	0.54987	0.00002	0.00004
QCA-QCB:	106	0.44997	0.44997	0.00000	0.00003

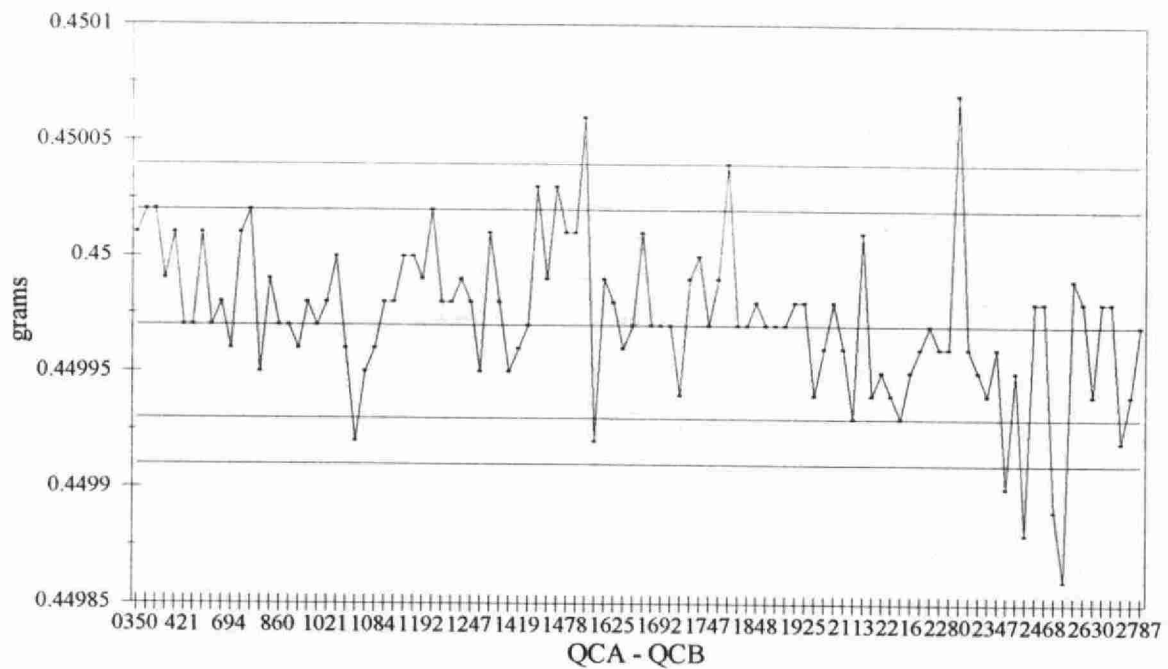
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
268	0 - 40	11.77000	1.02370
96	40 - 100	66.78100	3.23930
45	100 - 200	136.13800	6.32870

Suspended Solids Quality Control Data: 940101 to 941231



Suspended Solids Quality Control Data: 940101 to 941231



Suspended Solids

Quality Control Data from 950101 to 951231

Analytical Range: 200 mg/L

Detection Limit (W): 1.0 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.00003

Control Samples:

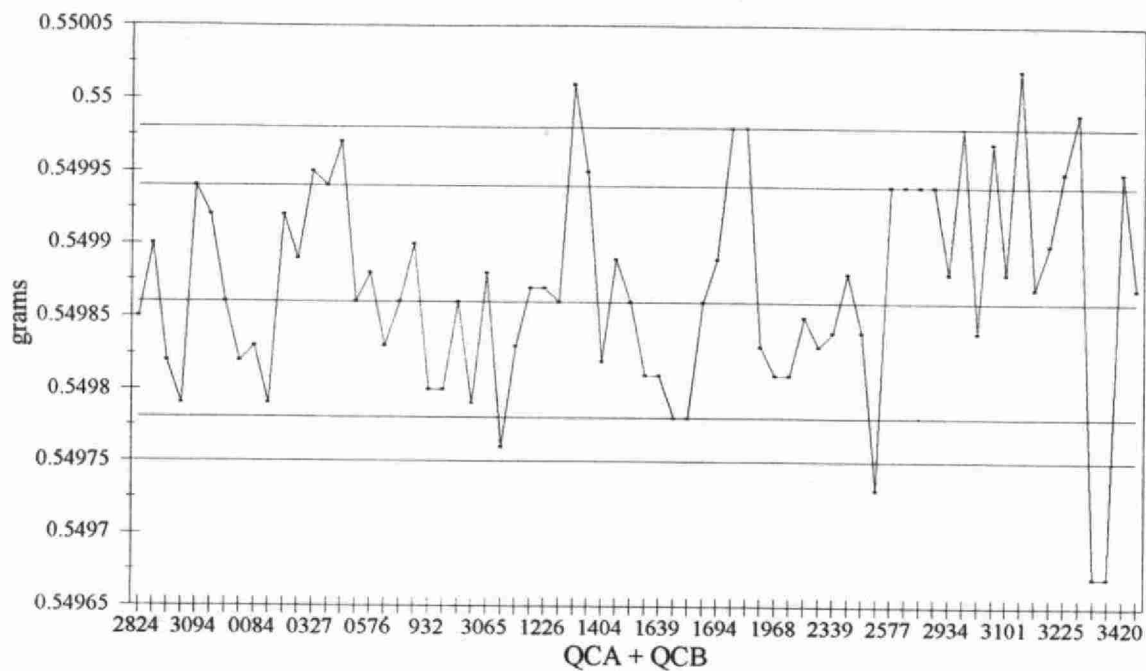
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	70	0.49992	0.49992	-0.00000	0.00004
QCB:	70	0.04995	0.04995	0.00000	0.00004
QCA+QCB:	70	0.54986	0.54987	0.00001	0.00007
QCA-QCB:	70	0.44998	0.44996	-0.00002	0.00004

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
135	0 - 40	9.33704	1.33087
31	40 - 100	75.60968	5.14067
23	100 - 200	132.82610	6.73247

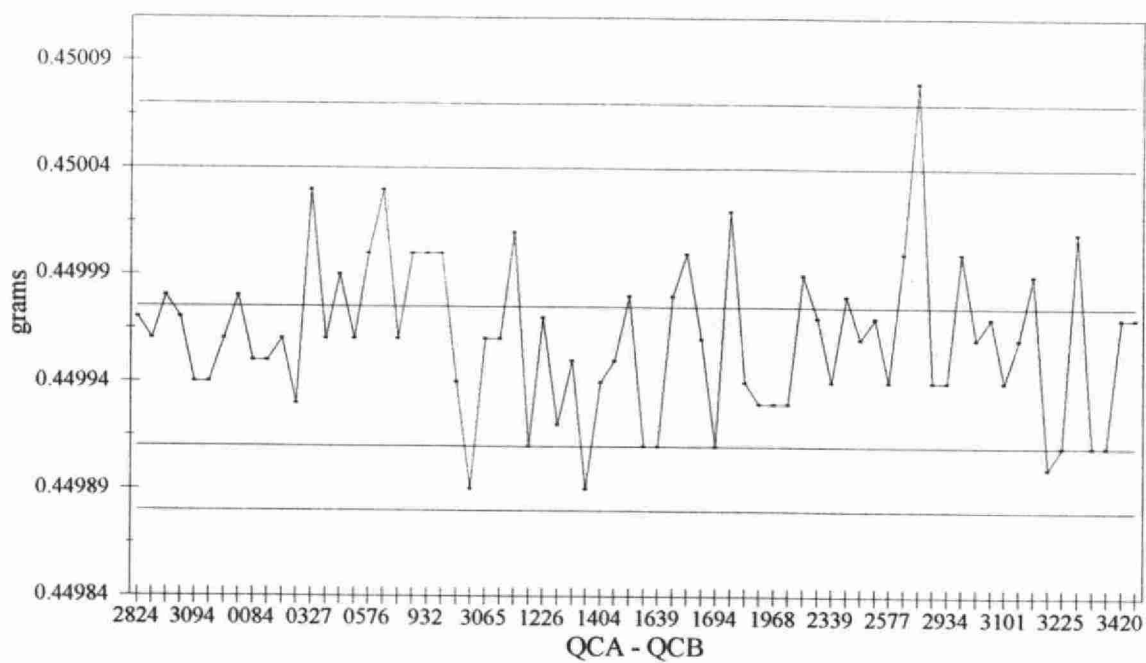
Suspended Solids

Quality Control Data: 950101 to 951231



Suspended Solids

Quality Control Data: 950101 to 951231



Dissolved Solids

Quality Control Data from 950101 to 951231

Analytical Range: 500 mg/L

Detection Limit (W): 5.0 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.00003

Control Samples:

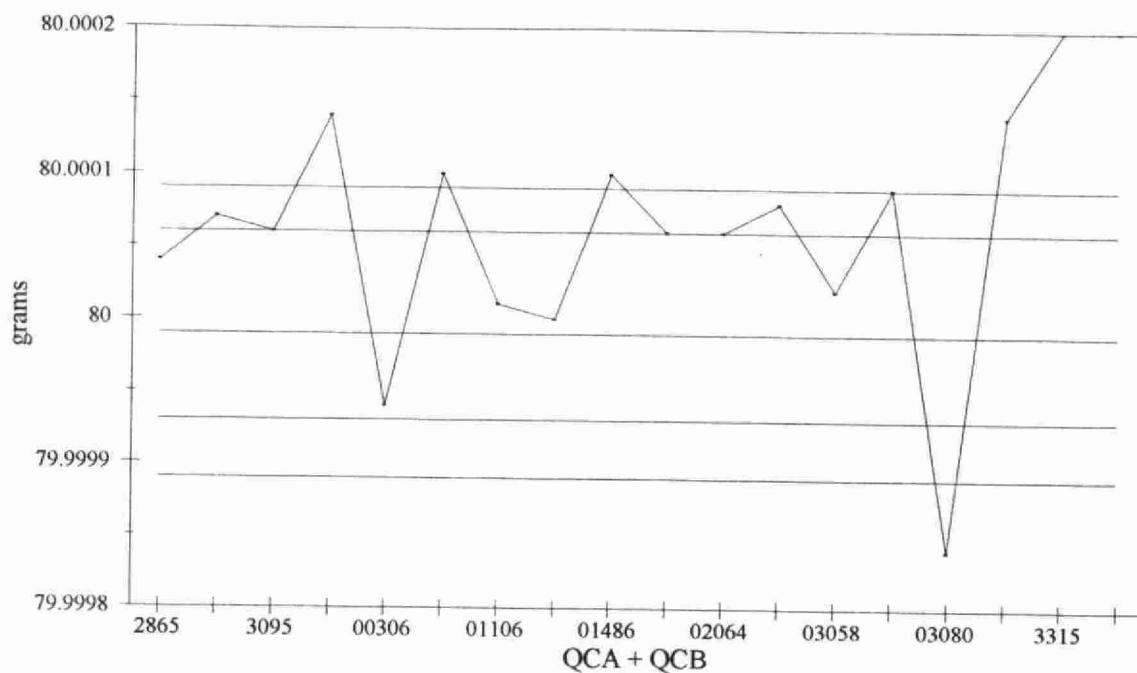
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	18	50.00003	50.00007	0.00004	0.00006
QCB:	18	29.99996	30.00000	0.00004	0.00004
QCA+QCB:	18	79.99999	80.00006	0.00007	0.00005
QCA-QCB:	18	20.00006	20.00007	0.00001	0.00005

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
8	0 - 100	58.60000	2.62033
9	100 - 250	161.22220	2.12132
14	250 - 500	359.07140	6.18755

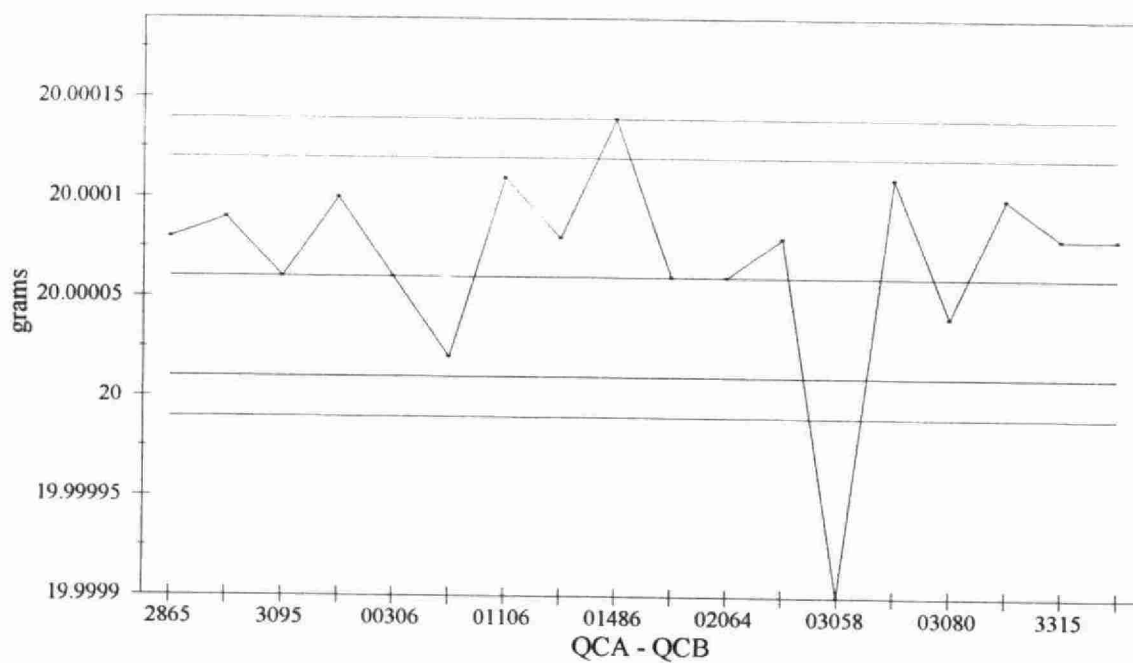
Dissolved Solids

Quality Control Data: 950101 to 951231



Dissolved Solids

Quality Control Data: 950101 to 951231



Ammonia

Quality Control Data from 940101 to 941231

Analytical Range: 0.80 mg/L

Detection Limit (W): 0.01 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0060

Sw(B-C): 0.0026

Control Samples:

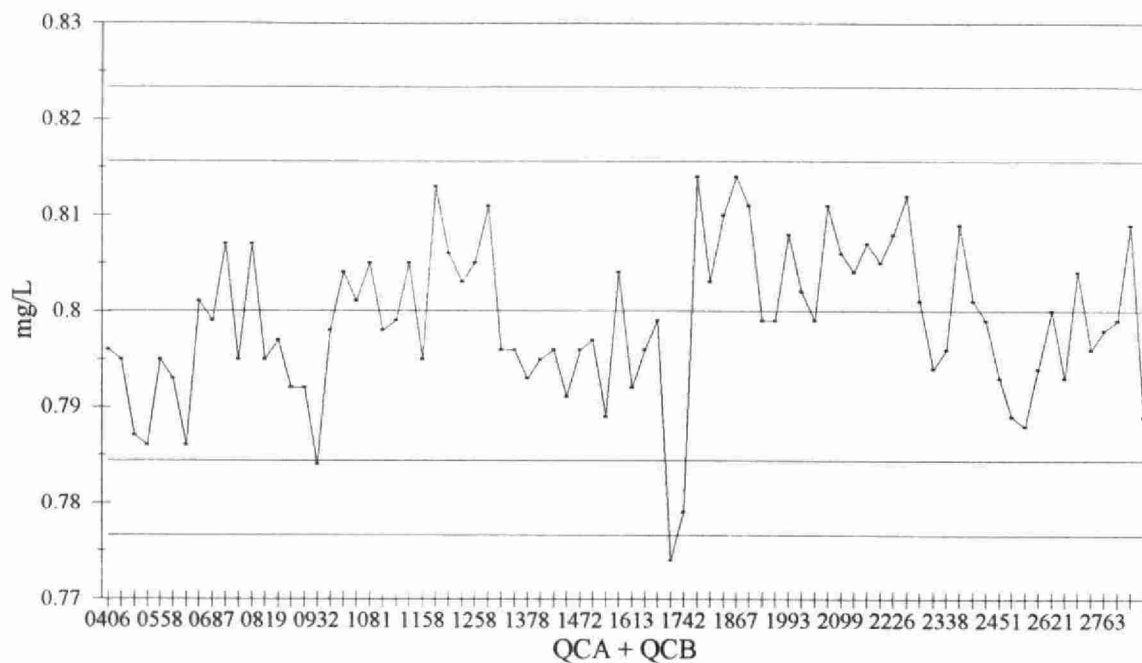
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	80	0.64	0.6403	0.0003	0.0068
QCB:	80	0.16	0.1586	-0.0015	0.0026
QCC:	80	0.064	0.0613	-0.0027	0.0019
QCA+QCB:	80	0.8	0.7988	-0.0012	0.0080
QCA-QCB:	80	0.48	0.4817	0.0017	0.0065
QCB+QCC:	80	0.224	0.2198	-0.0042	0.0037
QCB-QCC:	80	0.096	0.0973	0.0013	0.0027

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
205	0.0 - 0.16	0.0300	0.0035
25	0.16 - 0.40	0.2550	0.0067
5	0.40 - 0.80	0.5680	0.0085

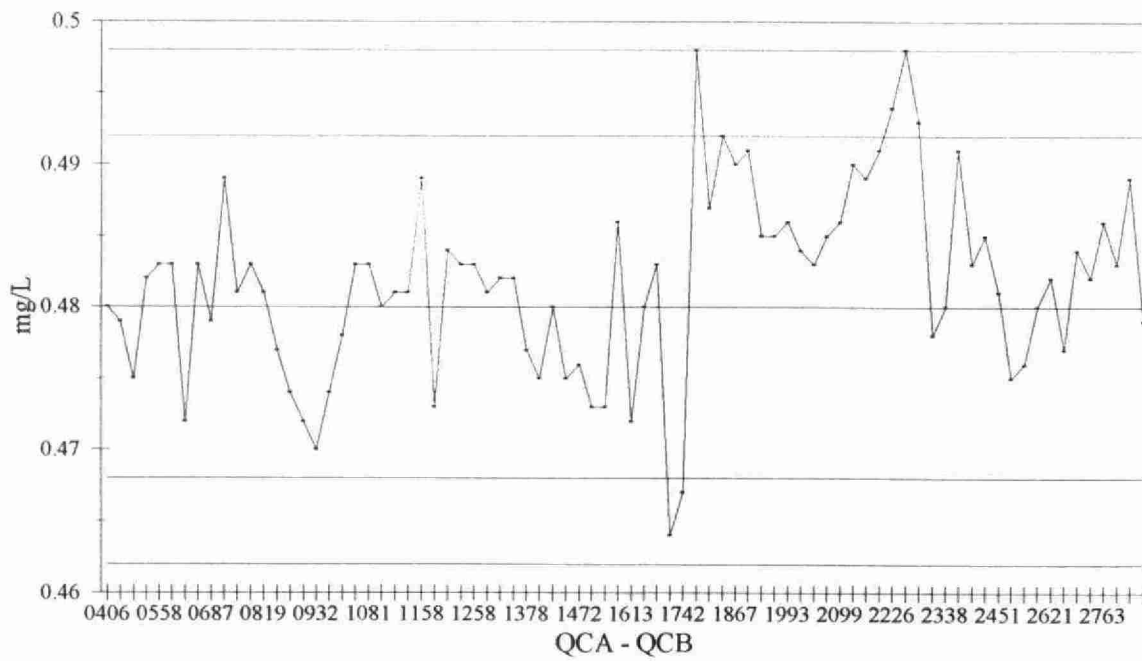
Ammonia

Quality Control Data: 940101 to 941231



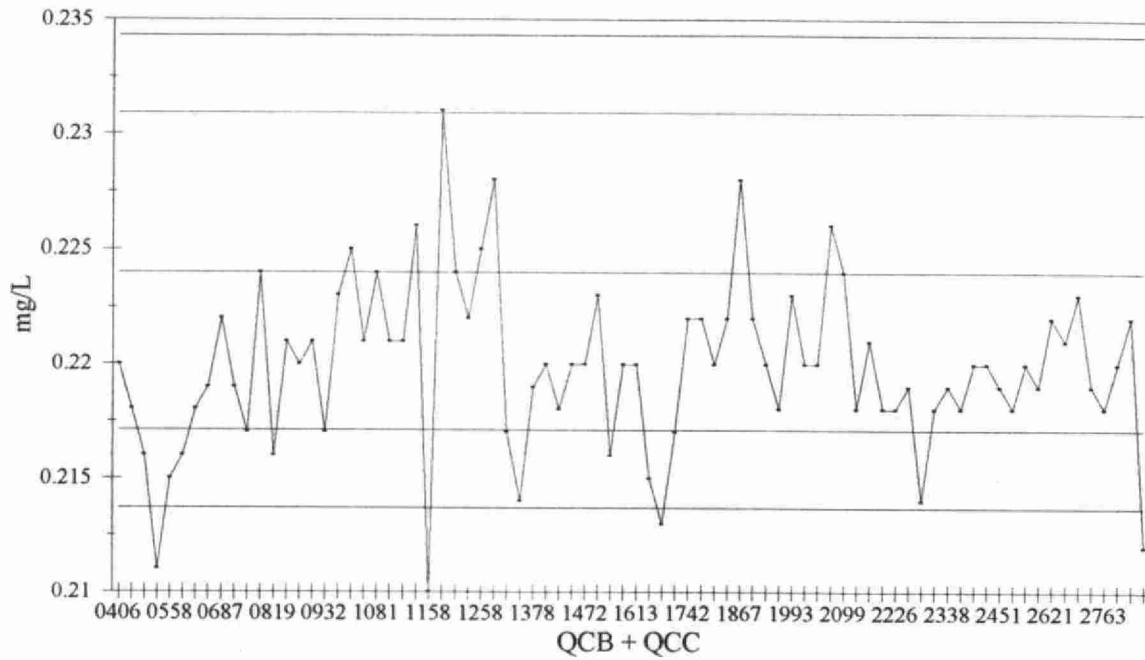
Ammonia

Quality Control Data: 940101 to 941231



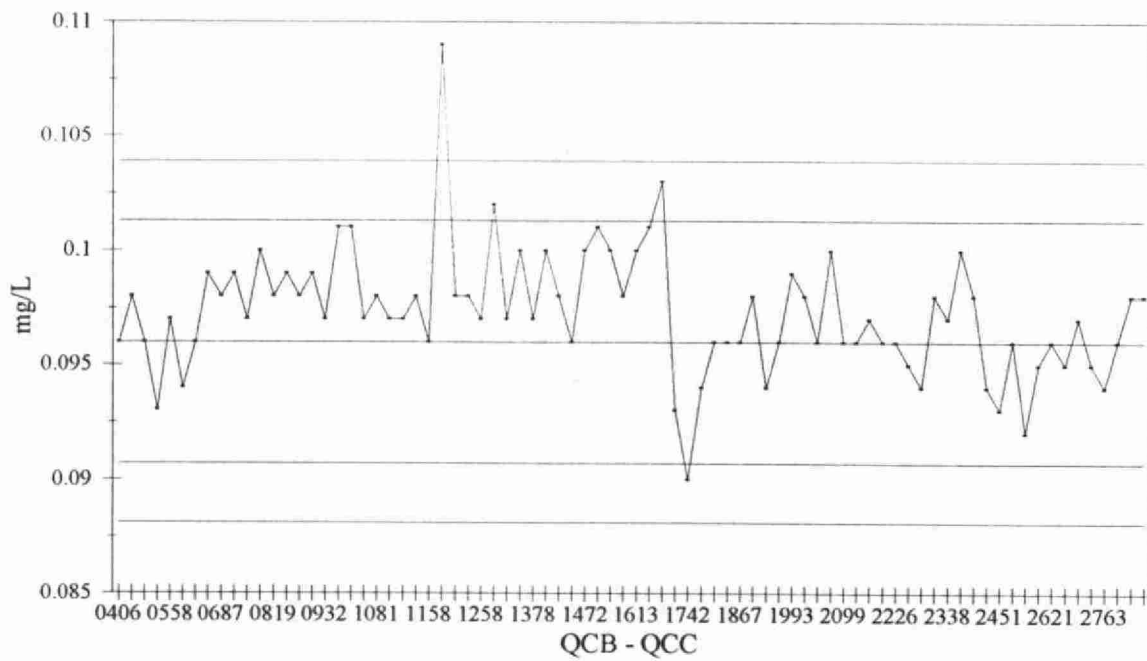
Ammonia

Quality Control Data: 940101 to 941231



Ammonia

Quality Control Data: 940101 to 941231



Ammonia

Quality Control Data from 950101 to 951231

Analytical Range: 0.80 mg/L

Detection Limit (W): 0.01 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0065

Sw(B-C): 0.0027

Control Samples:

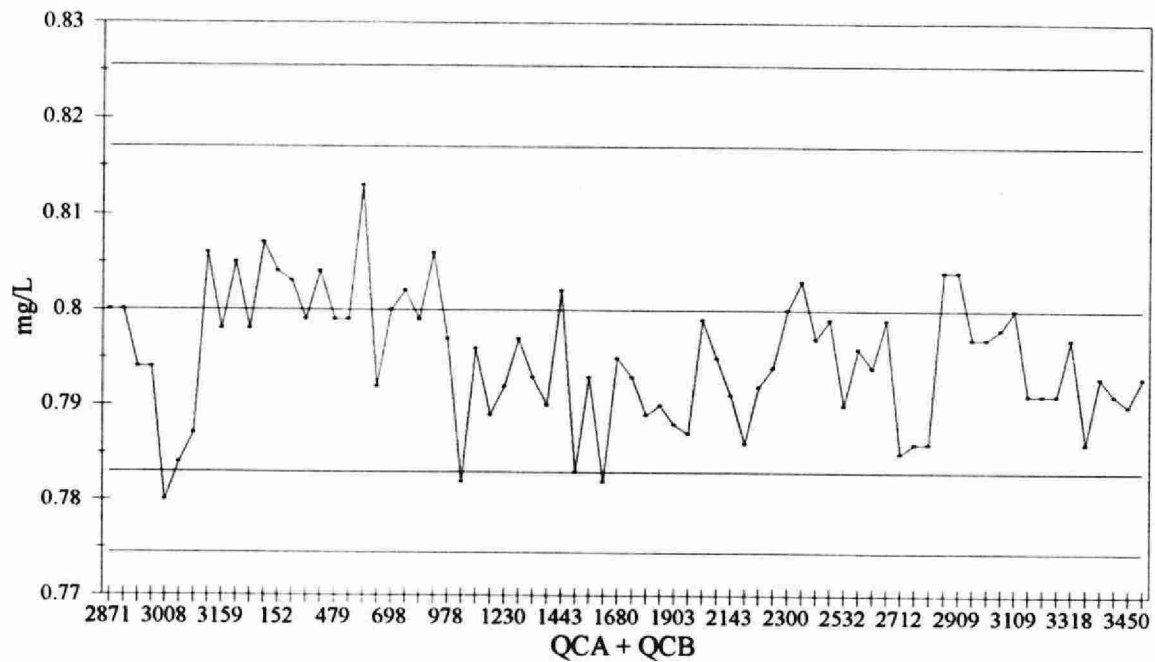
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	74	0.64	0.6393	-0.0007	0.0050
QCB:	74	0.16	0.1556	-0.0044	0.0038
QCC:	74	0.064	0.0611	-0.0029	0.0020
QCA+QCB:	74	0.8	0.7949	-0.0051	0.0068
QCA-QCB:	74	0.48	0.4837	0.0037	0.0057
QCB+QCC:	74	0.224	0.2167	-0.0073	0.0050
QCB-QCC:	74	0.096	0.0946	-0.0014	0.0035

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
186	0.0 - 0.16	0.0292	0.0026
13	0.16 - 0.40	0.2801	0.0075
9	0.40 - 0.80	0.5027	0.0055

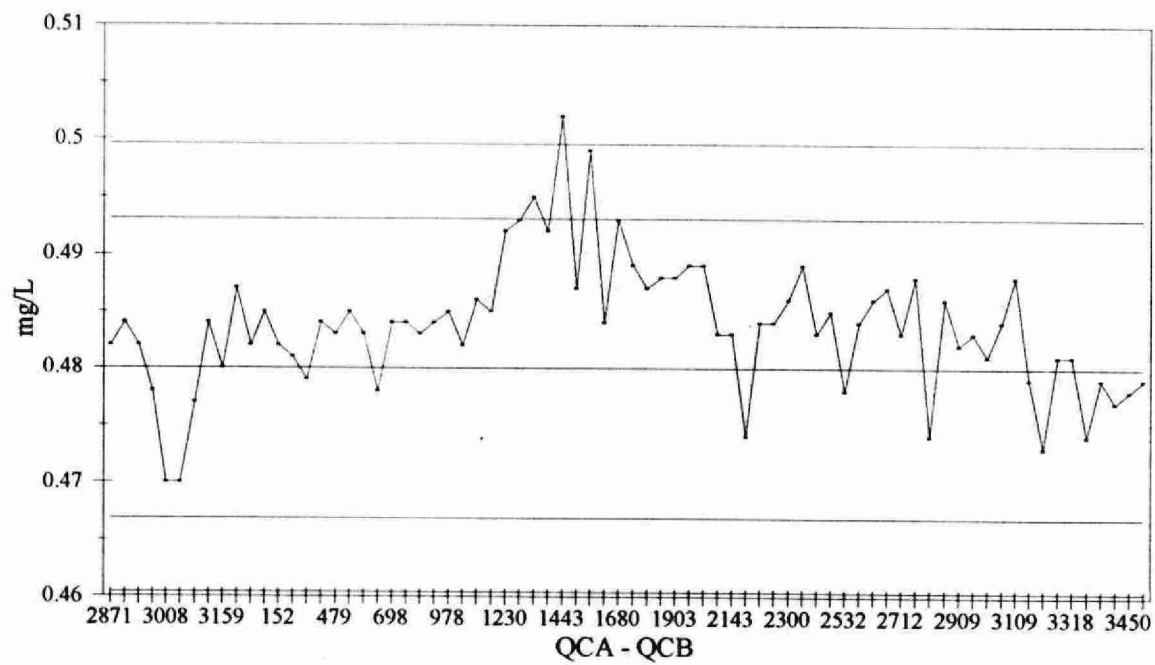
Ammonia

Quality Control Data: 950101 to 951231



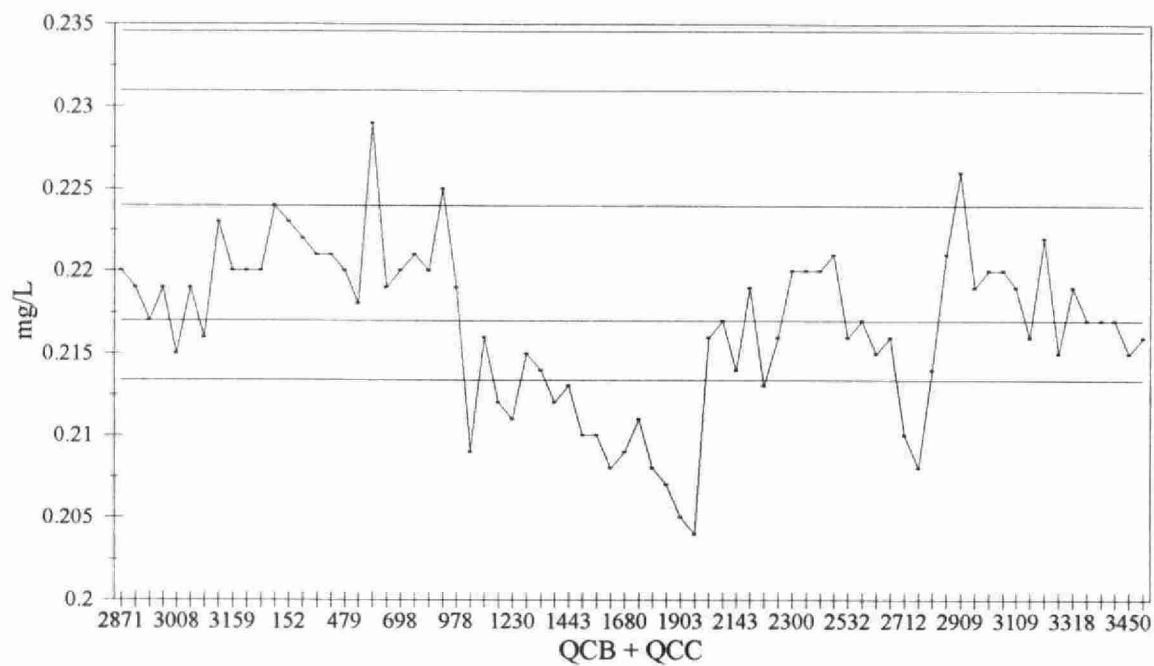
Ammonia

Quality Control Data: 950101 to 951231



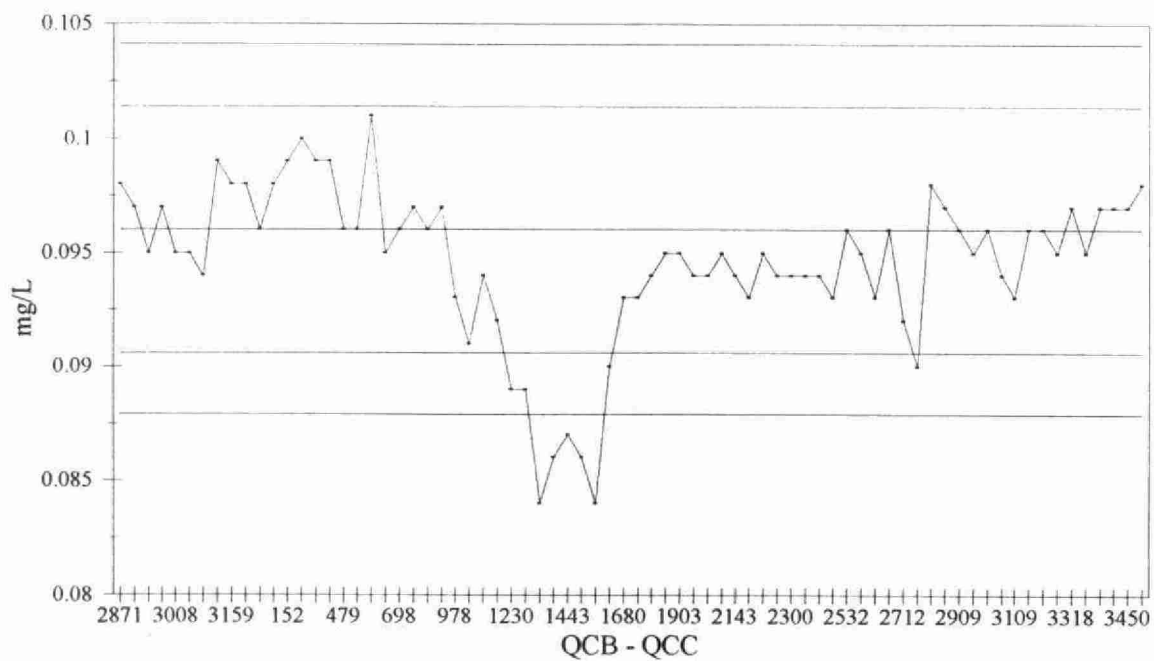
Ammonia

Quality Control Data: 950101 to 951231



Ammonia

Quality Control Data: 950101 to 951231



Nitrite

Quality Control Data from 940101 to 941231

Analytical Range: 0.10 mg/L

Detection Limit (W): 0.001 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0008

Sw(B-C): 0.0004

Control Samples:

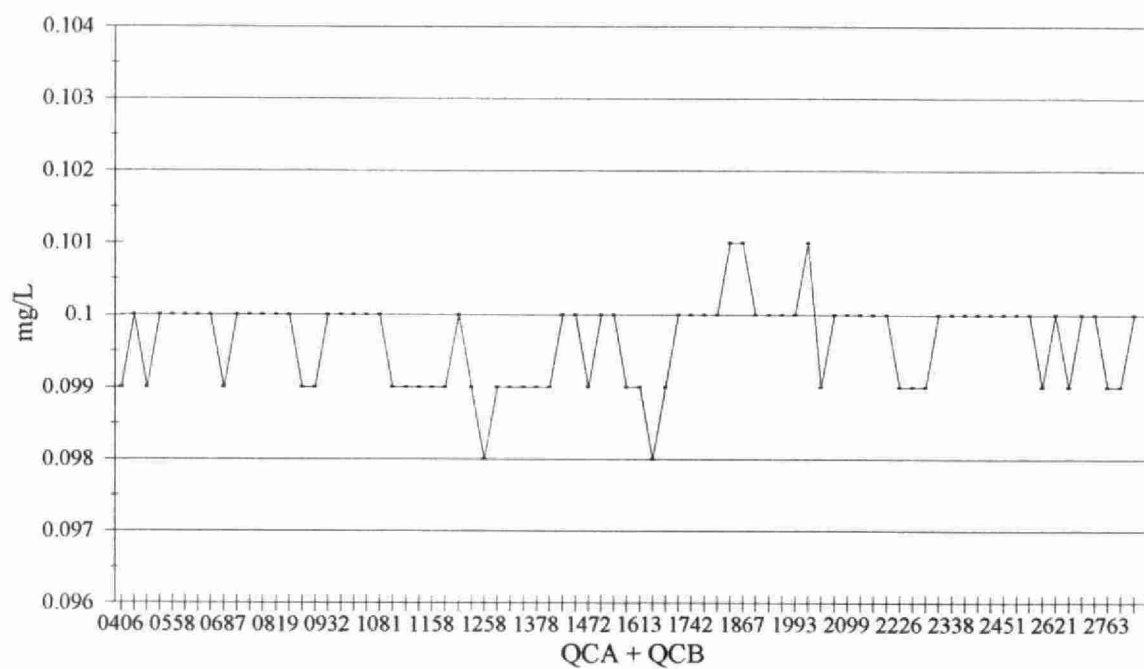
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	80	0.08	0.0797	-0.0003	0.0006
QCB:	80	0.02	0.0199	-0.0001	0.0003
QCC:	80	0.008	0.0080	-0.0000	0.0002
QCA+QCB:	80	0.1	0.0996	-0.0004	0.0006
QCA-QCB:	80	0.06	0.0598	-0.0002	0.0007
QCB+QCC:	80	0.028	0.0279	-0.0001	0.0004
QCB-QCC:	80	0.012	0.0120	-0.0000	0.0003

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
229	0.0 - 0.02	0.0030	0.0005
4	0.02 - 0.05	0.0400	0.0011
3	0.05 - 0.10	0.0660	0.0000

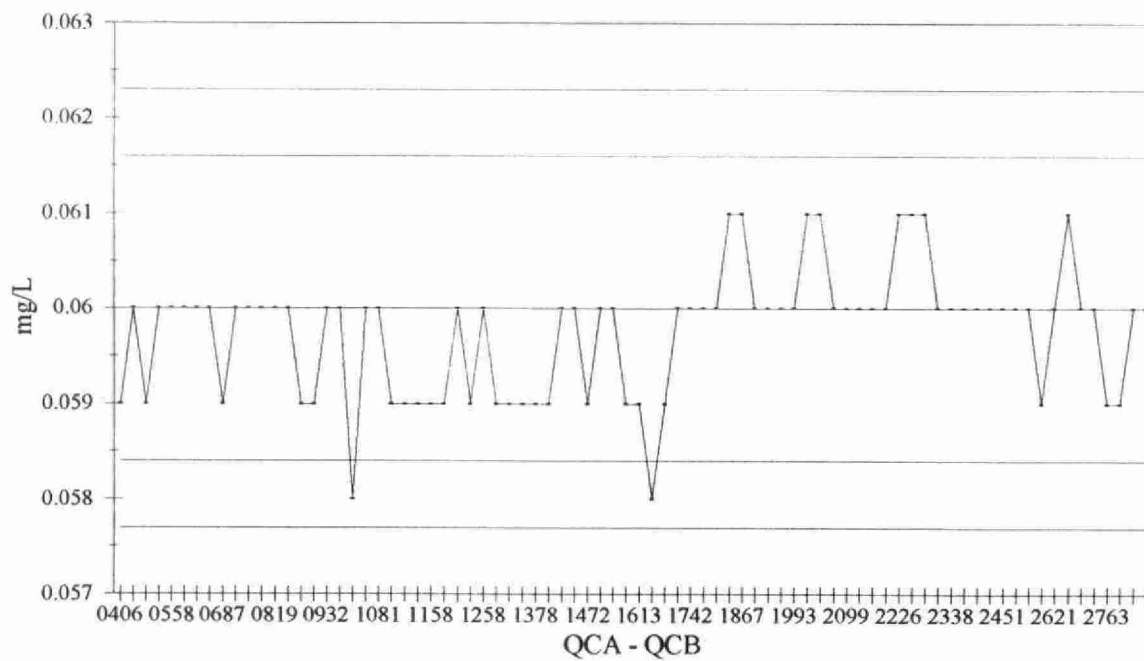
Nitrite

Quality Control Data: 940101 to 941231



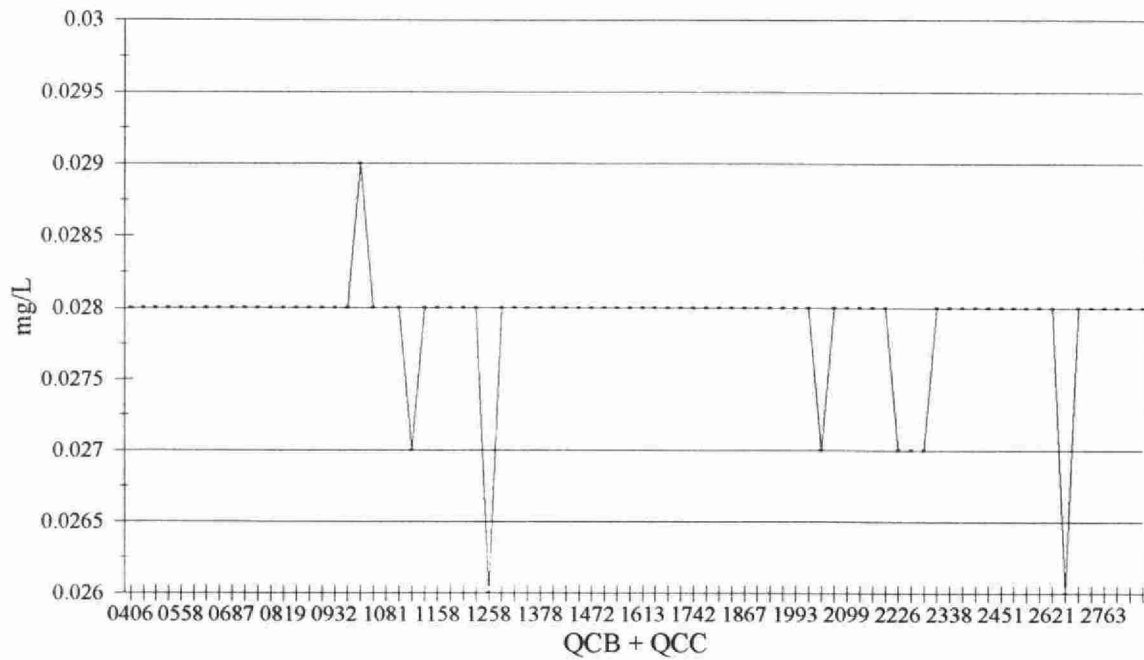
Nitrite

Quality Control Data: 940101 to 941231



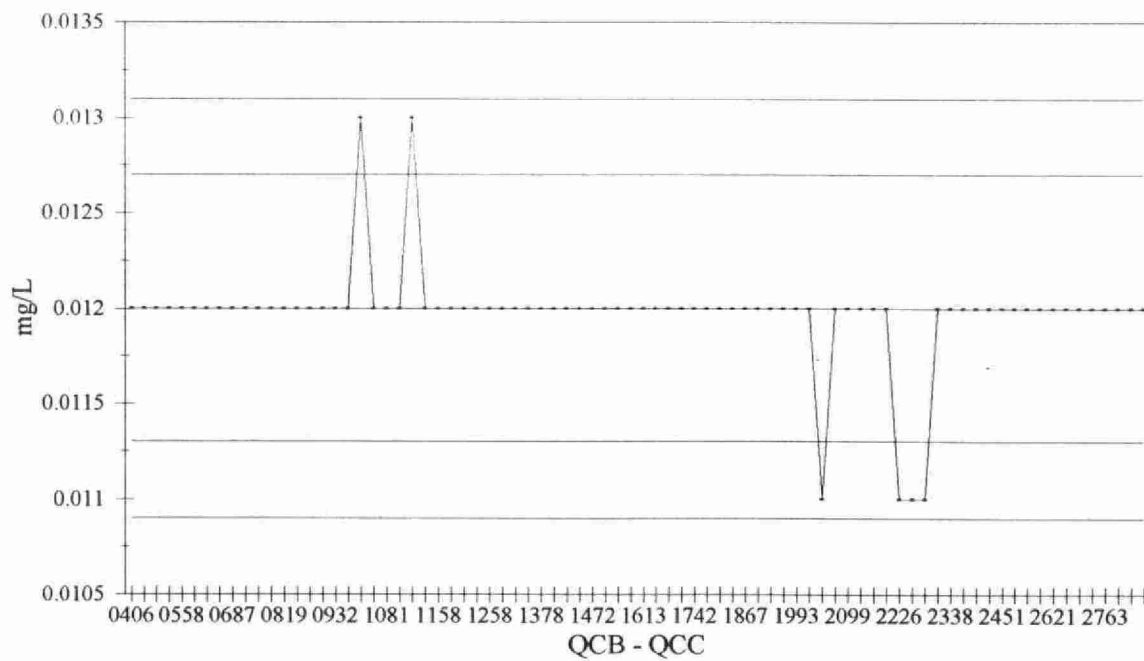
Nitrite

Quality Control Data: 940101 to 941231



Nitrite

Quality Control Data: 940101 to 941231



Nitrite

Quality Control Data from 950101 to 951231

Analytical Range: 0.10 mg/L

Detection Limit (W): 0.001 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0007

Sw(B-C): 0.0003

Control Samples:

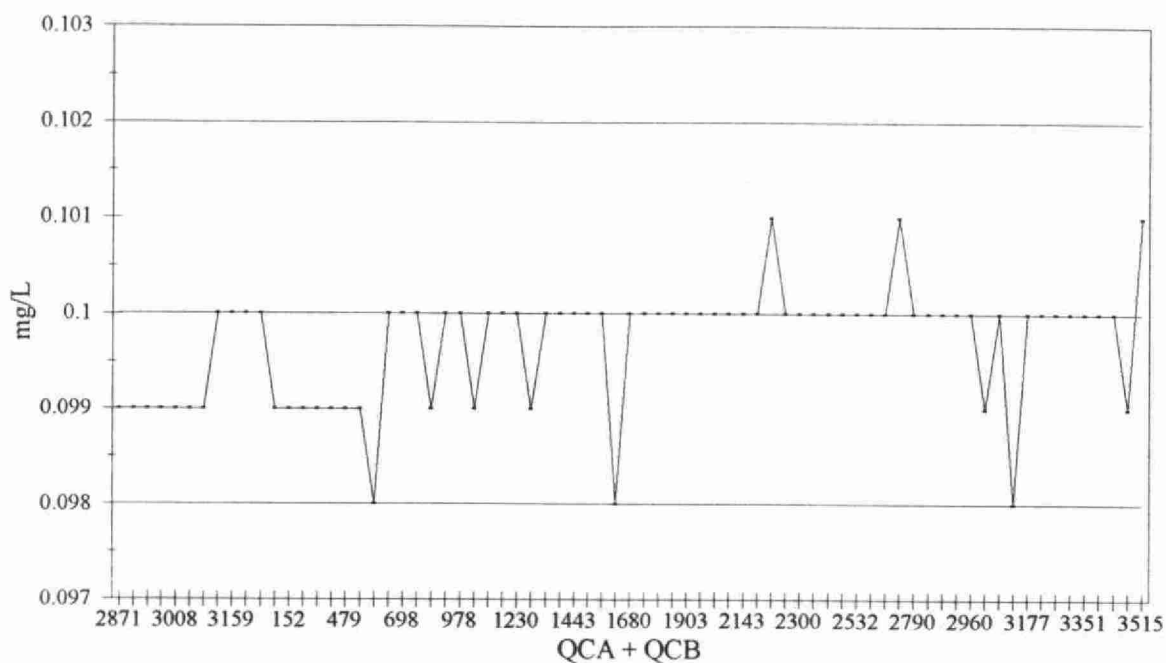
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	73	0.08	0.0797	-0.0003	0.0006
QCB:	73	0.02	0.0200	-0.0000	0.0002
QCC:	73	0.008	0.0080	0.0000	0.0000
QCA+QCB:	73	0.1	0.0997	-0.0003	0.0006
QCA-QCB:	73	0.06	0.0598	-0.0002	0.0006
QCB+QCC:	73	0.028	0.0280	-0.0000	0.0002
QCB-QCC:	73	0.012	0.0120	-0.0000	0.0002

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
208	0.0 - 0.02	0.0028	0.0004
7	0.02 - 0.05	0.0309	0.0007
4	0.05 - 0.10	0.0658	0.0007

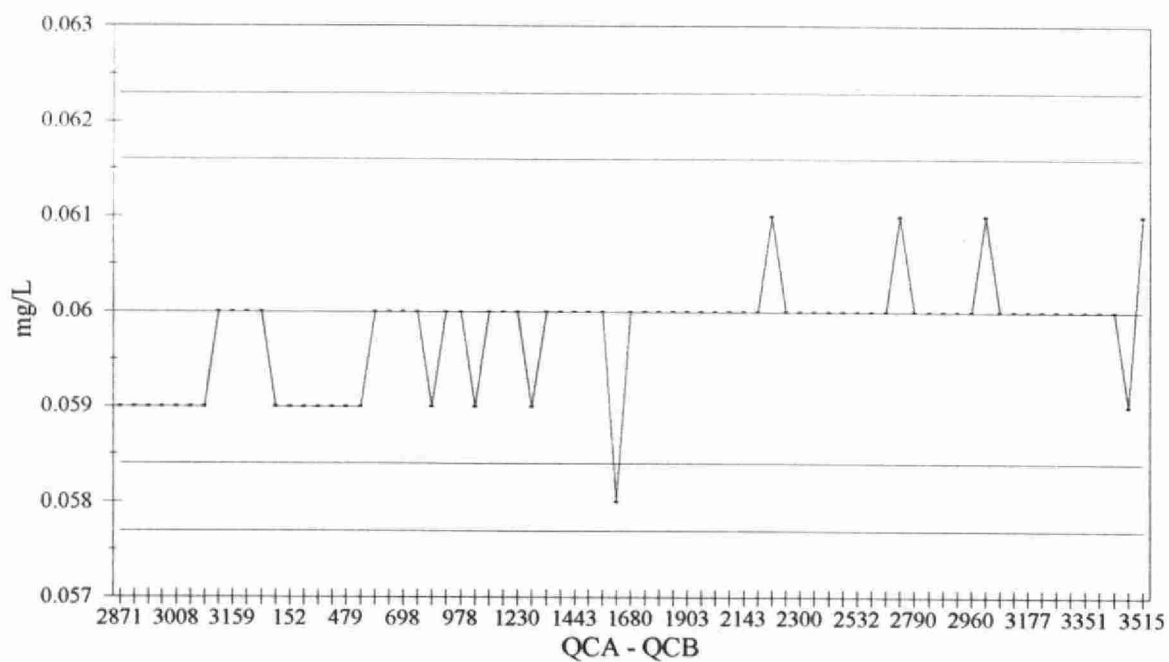
Nitrite

Quality Control Data: 950101 to 951231



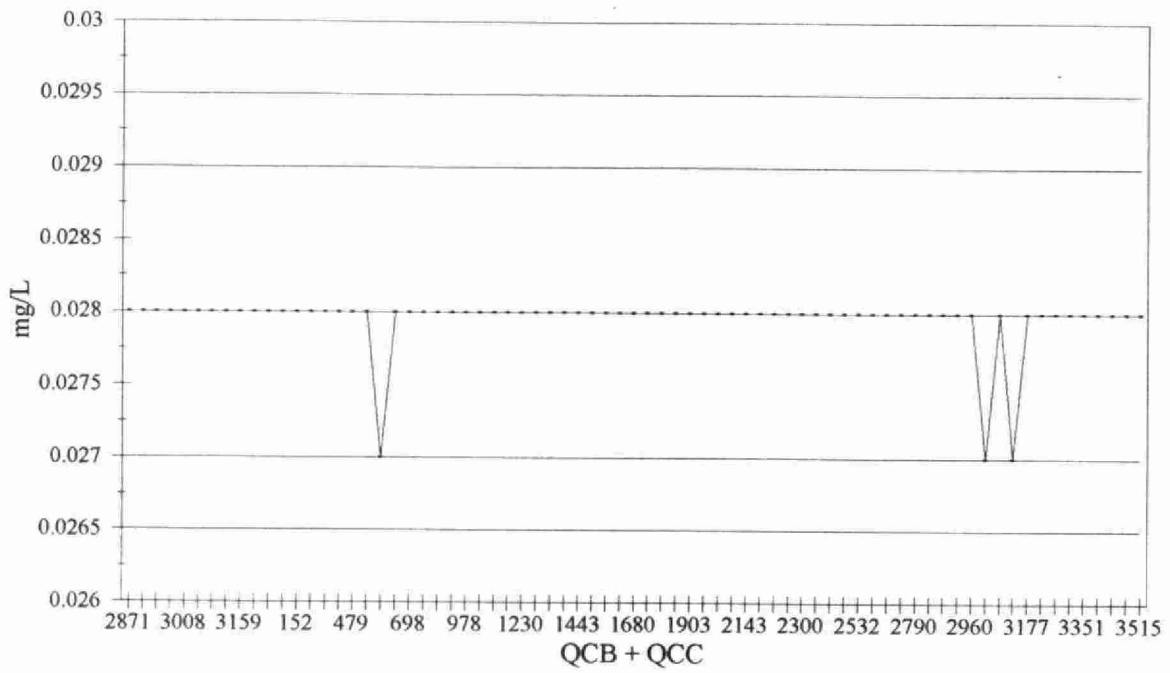
Nitrite

Quality Control Data: 950101 to 951231



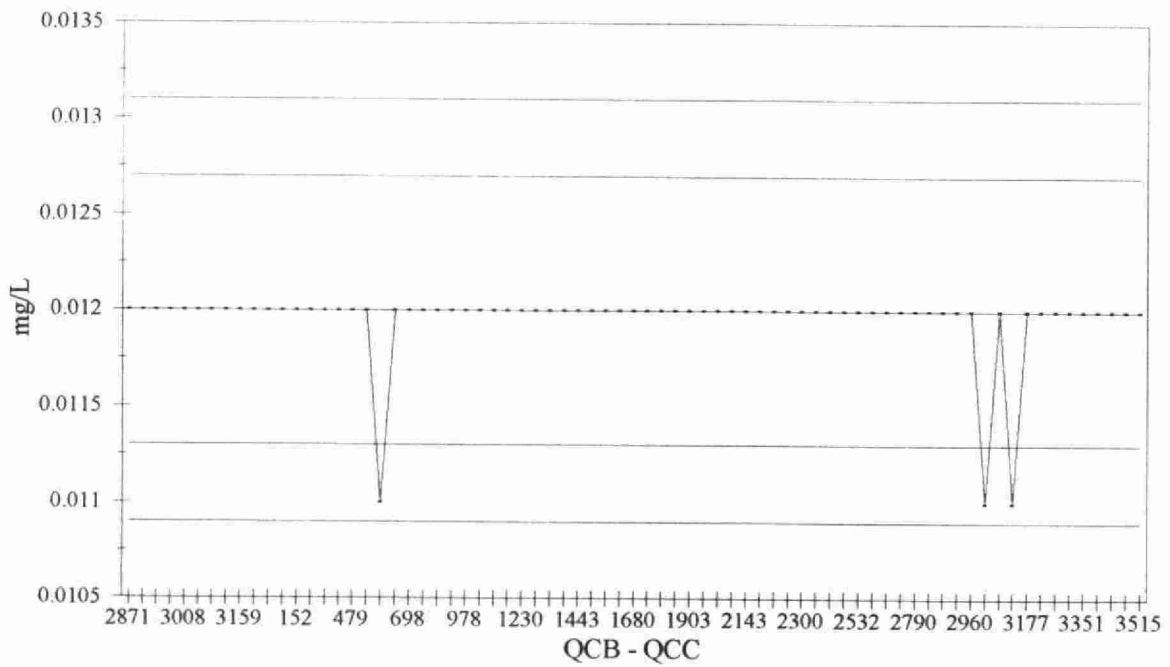
Nitrite

Quality Control Data: 950101 to 951231



Nitrite

Quality Control Data: 950101 to 951231



Nitrate and Nitrite

Quality Control Data from 940101 to 940101

Analytical Range: 0.50 mg/L

Detection Limit (W): 0.01 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0039

Sw(B-C): 0.0015

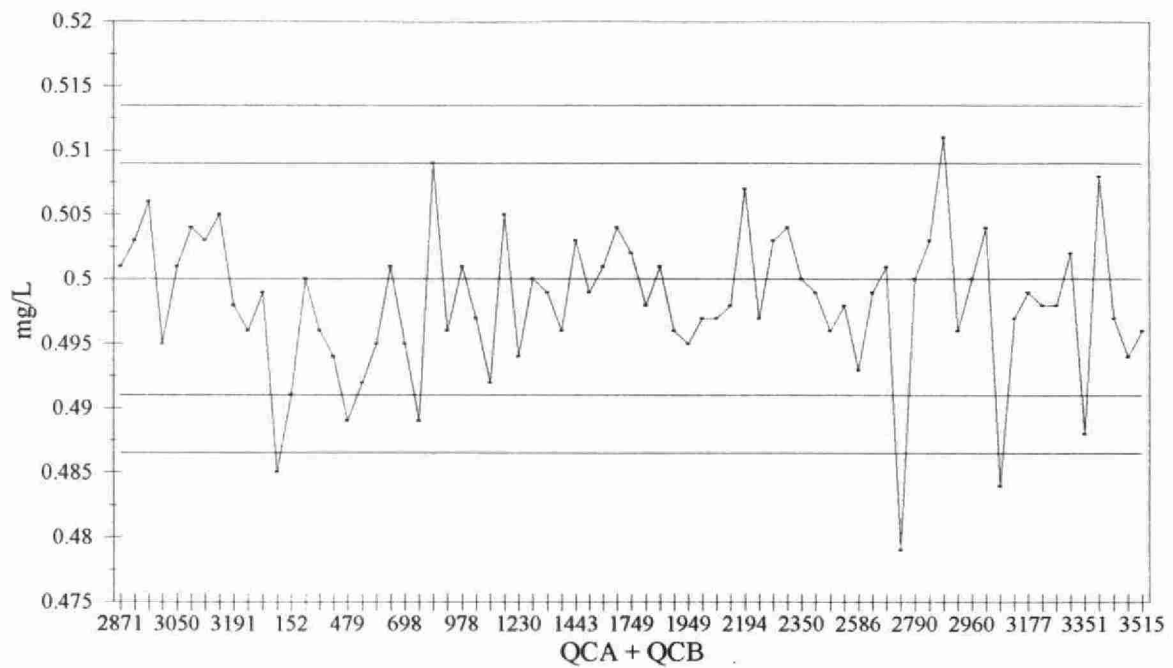
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	80	0.4	0.4010	0.0010	0.0035
QCB:	80	0.1	0.1000	0.0000	0.0022
QCC:	80	0.04	0.0400	0.0000	0.0018
QCA+QCB:	80	0.5	0.5010	0.0010	0.0047
QCA-QCB:	80	0.3	0.3010	0.0010	0.0035
QCB+QCC:	80	0.14	0.1400	0.0000	0.0035
QCB-QCC:	80	0.06	0.0600	0.0000	0.0019

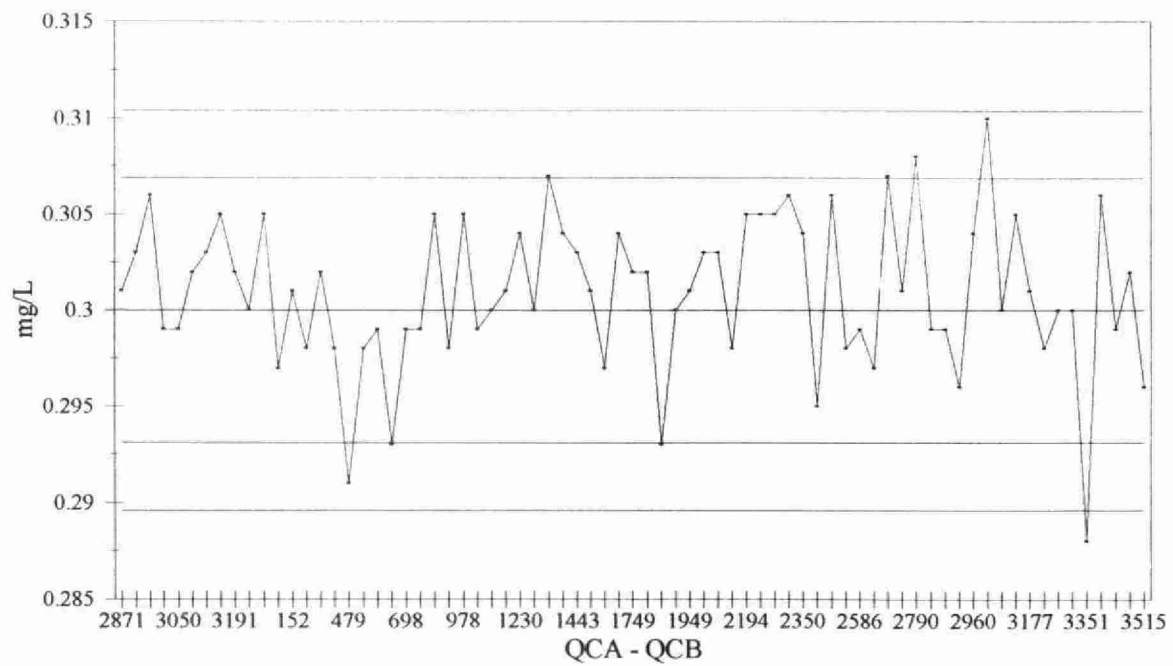
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
118	0.00 - 0.10	0.0250	0.0040
50	0.10 - 0.25	0.1800	0.0040
41	0.25 - 0.50	0.3410	0.0060

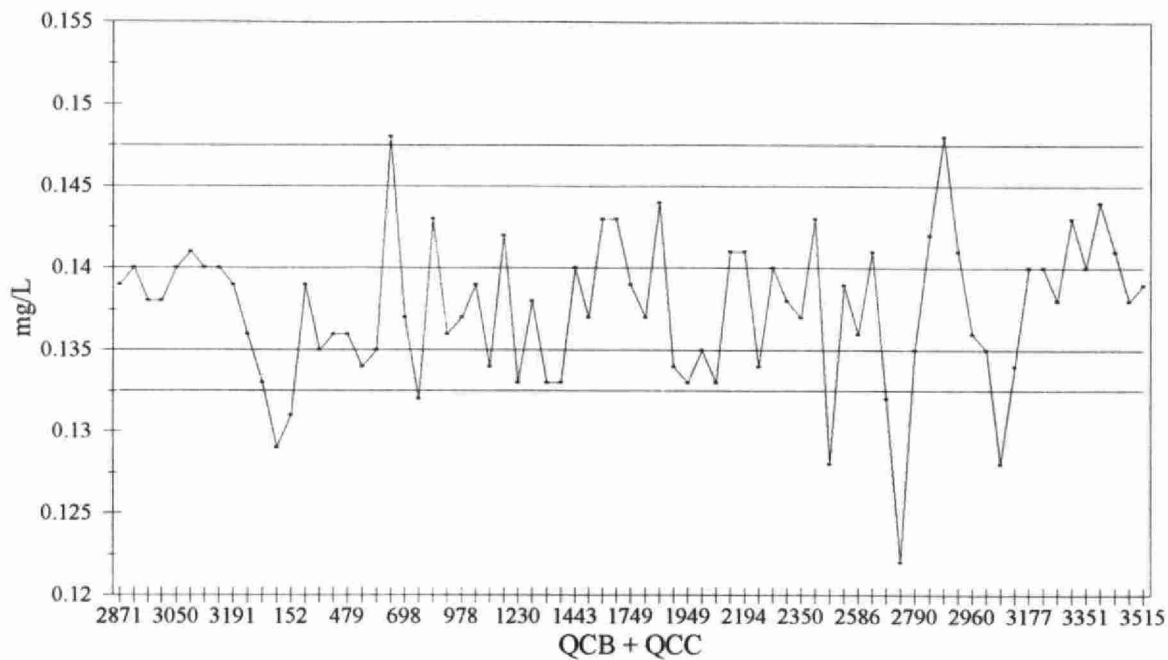
Nitrate and Nitrite Quality Control Data: 940101 to 941231



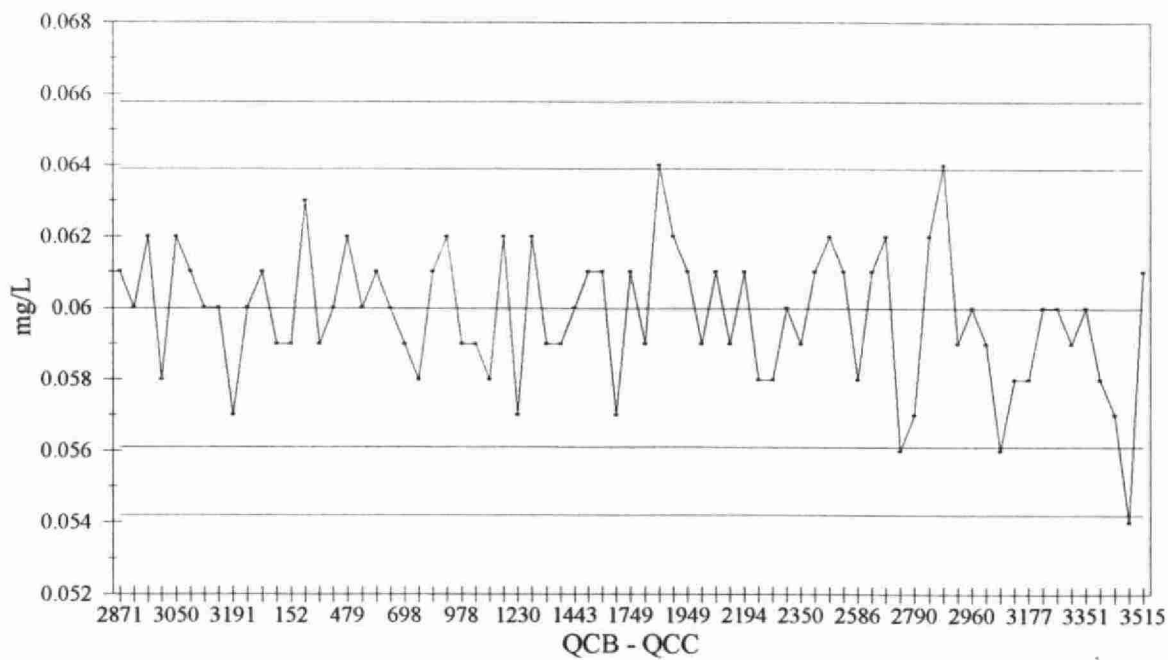
Nitrate and Nitrite Quality Control Data: 940101 to 940101



Nitrate and Nitrite Quality Control Data: 940101 to 940101



Nitrate and Nitrite Quality Control Data: 940101 to 940101



Nitrate and Nitrite

Quality Control Data from 950101 to 951231

Analytical Range: 0.50 mg/L

Detection Limit (W): 0.01 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0035

Sw(B-C): 0.0019

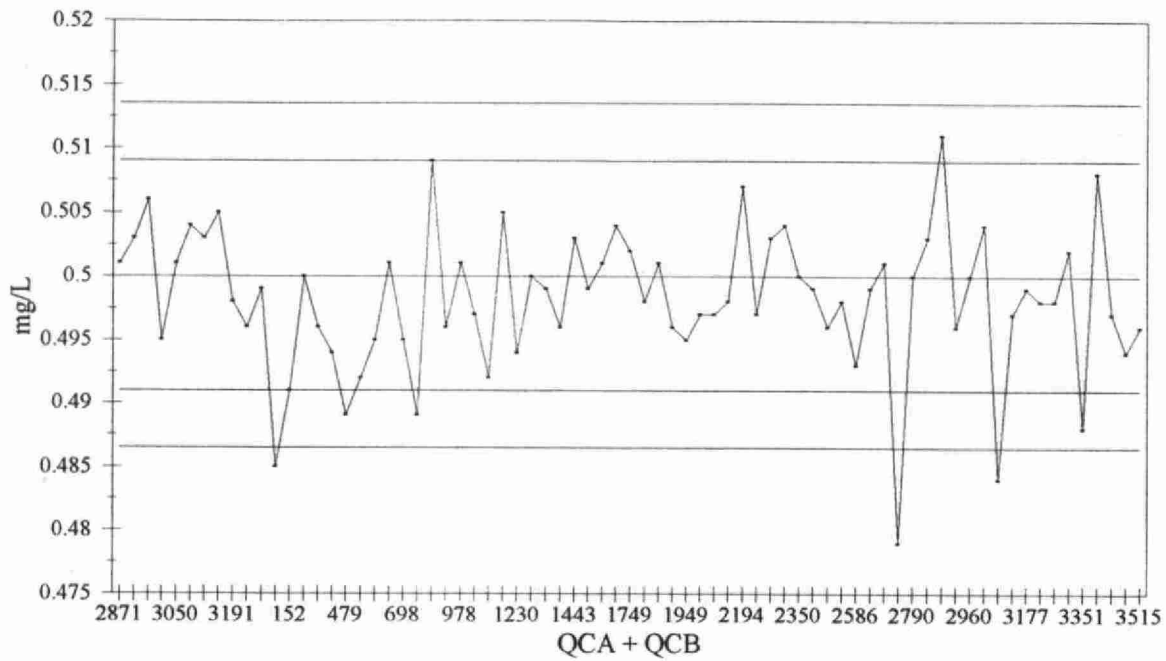
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	73	0.4	0.3996	-0.0004	0.0041
QCB:	73	0.1	0.0986	-0.0014	0.0027
QCC:	73	0.04	0.0388	-0.0012	0.0022
QCA+QCB:	73	0.5	0.4982	-0.0018	0.0056
QCA-QCB:	73	0.3	0.3009	0.0009	0.0040
QCB+QCC:	73	0.14	0.1375	-0.0025	0.0045
QCB-QCC:	73	0.06	0.0598	-0.0002	0.0019

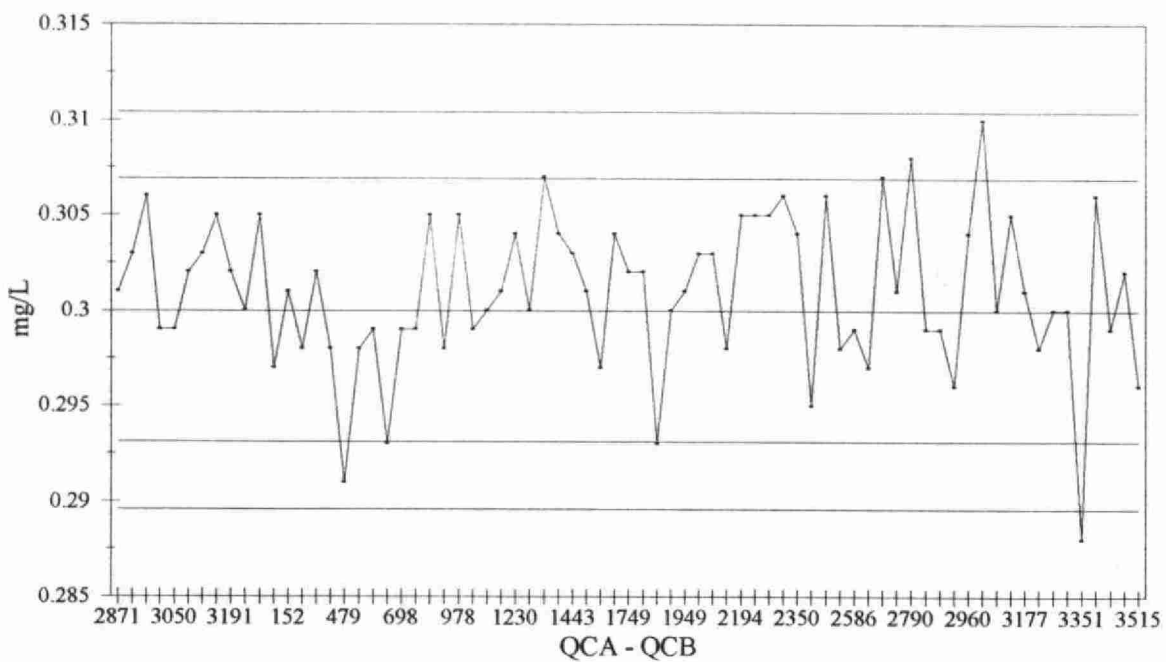
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
123	0.00 - 0.10	0.0236	0.0025
35	0.10 - 0.25	0.1740	0.0044
30	0.25 - 0.50	0.3238	0.0051

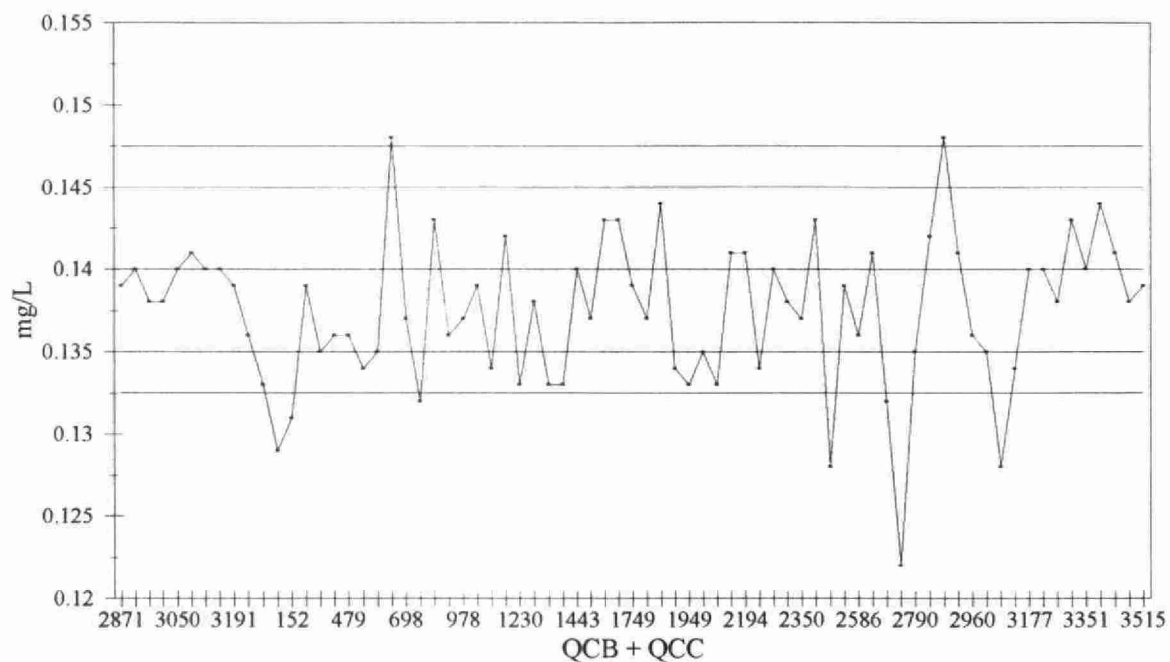
Nitrate and Nitrite Quality Control Data: 950101 to 951231



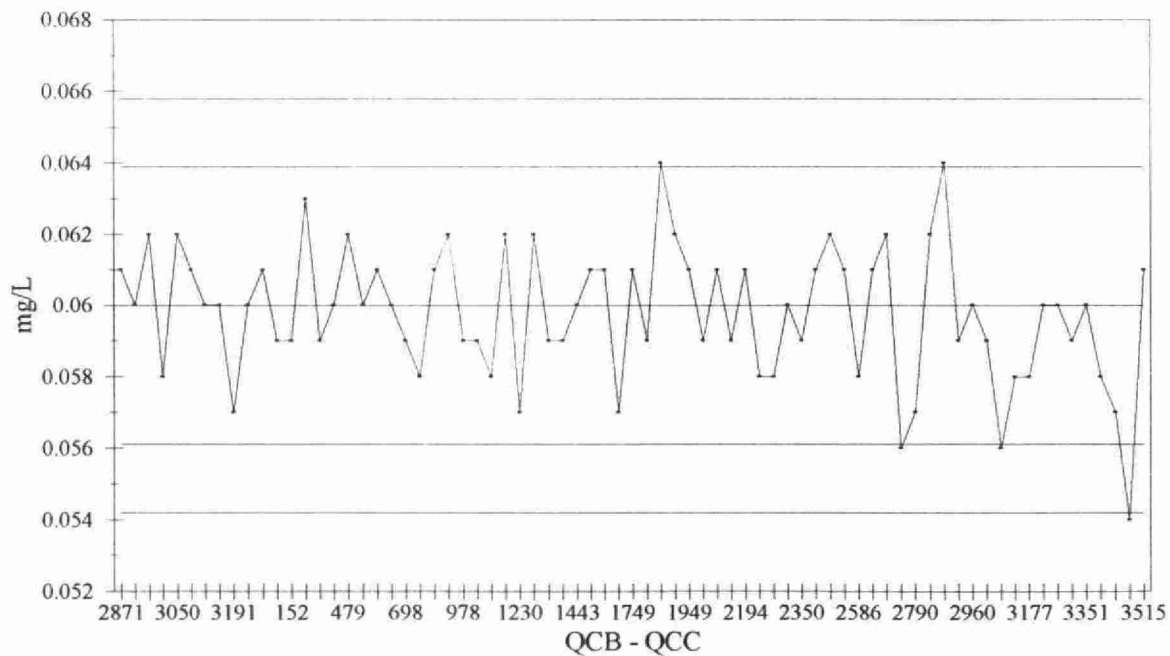
Nitrate and Nitrite Quality Control Data: 950101 to 951231



Nitrate and Nitrite Quality Control Data: 950101 to 951231



Nitrate and Nitrite Quality Control Data: 950101 to 951231



Nitrate

Quality Control Data from 940101 to 941231

Analytical Range: 0.50 mg/L

Detection Limit (W): 0.01 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0039

Sw(B-C): 0.0015

Control Samples:

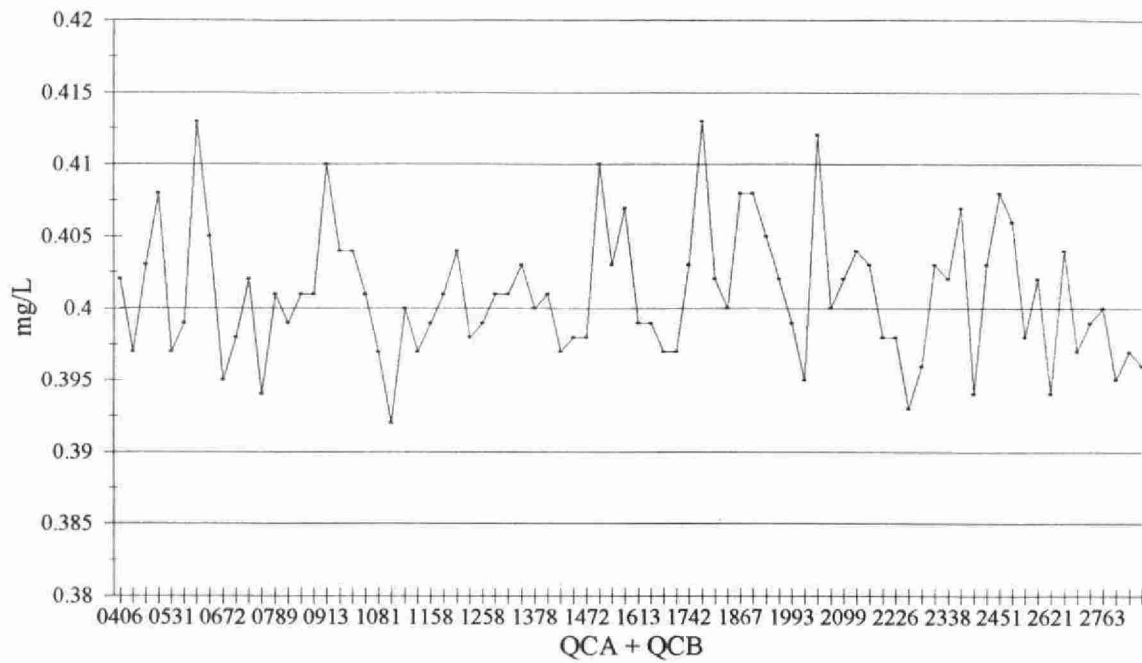
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	80	0.32	0.3212	0.0012	0.0035
QCB:	80	0.08	0.0797	-0.0003	0.0021
QCC:	80	0.032	0.0321	0.0001	0.0018
QCA+QCB:	80	0.4	0.4010	0.0010	0.0046
QCA-QCB:	80	0.24	0.2415	0.0015	0.0035
QCB+QCC:	80	0.112	0.1118	-0.0002	0.0034
QCB-QCC:	80	0.048	0.0477	-0.0003	0.0020

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
120	0.0 - 0.10	0.0240	0.0038
48	0.10 - 0.25	0.1800	0.0044
38	0.25 - 0.50	0.3380	0.0059

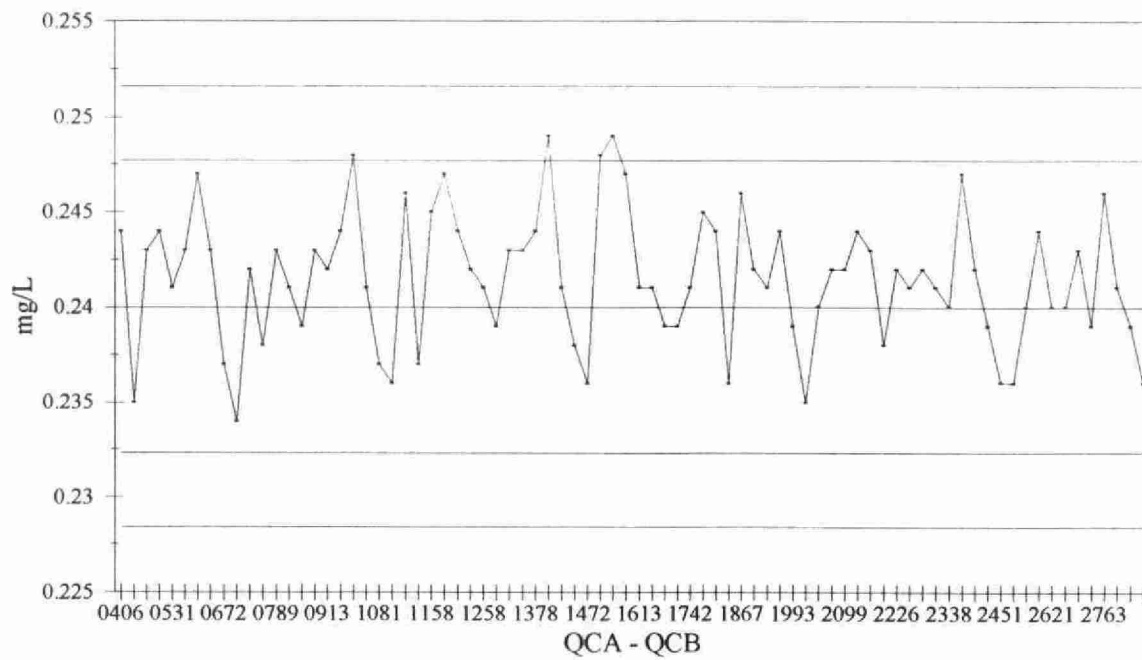
Nitrate

Quality Control Data: 940101 to 941231



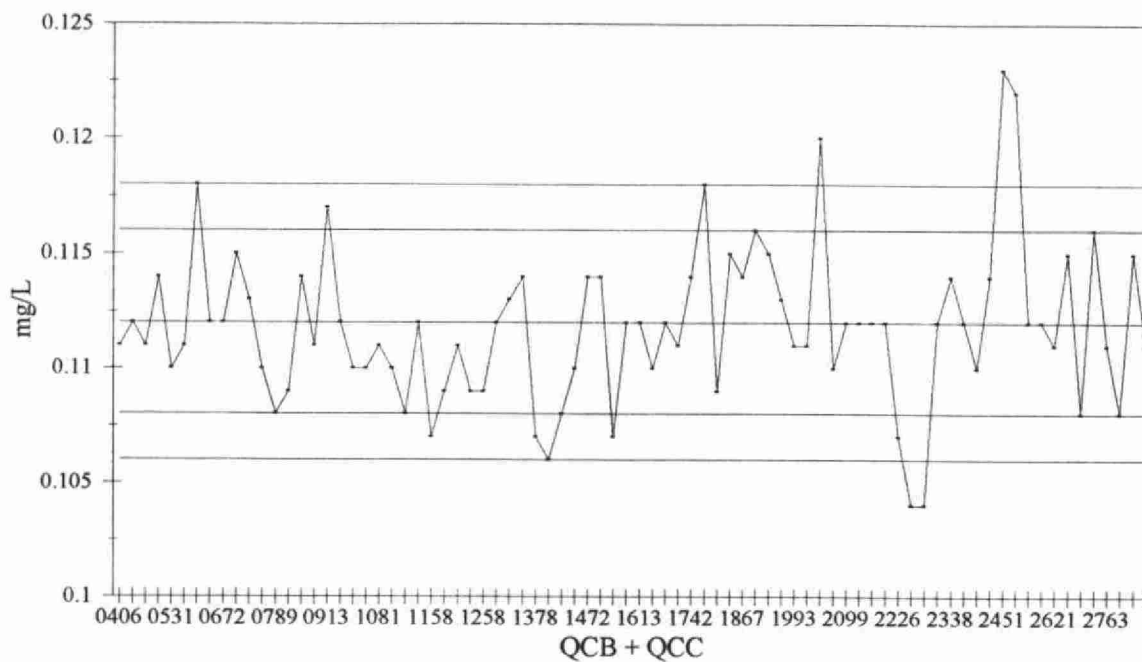
Nitrate

Quality Control Data: 940101 to 941231



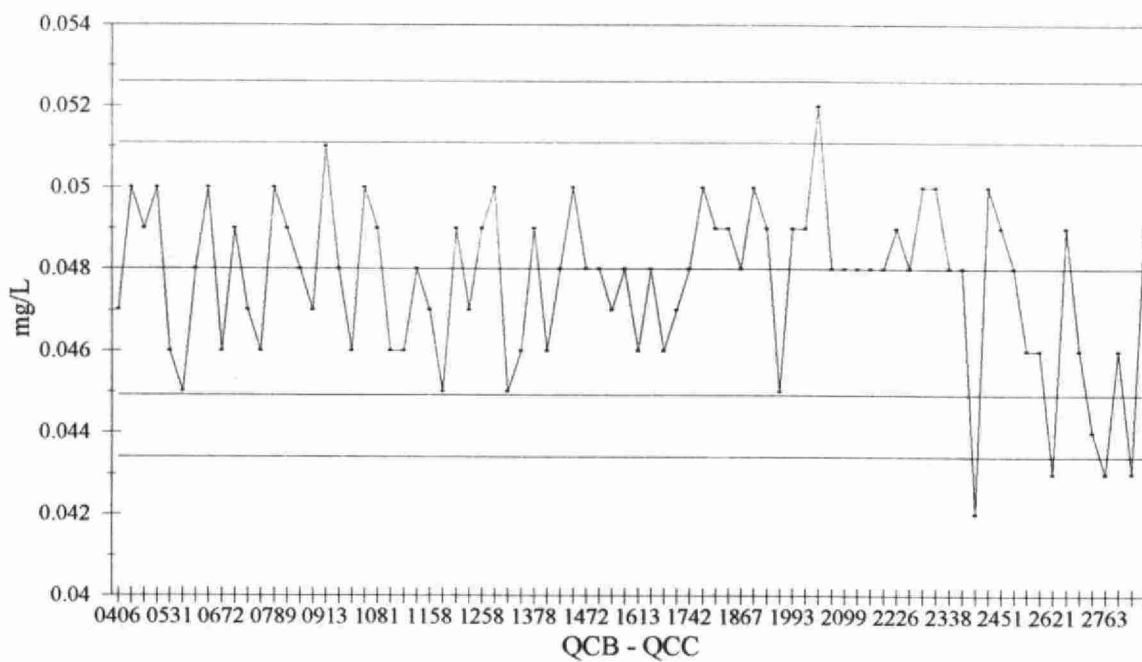
Nitrate

Quality Control Data: 940101 to 941231



Nitrate

Quality Control Data: 940101 to 941231



Nitrate

Quality Control Data from 950101 to 951231

Analytical Range: 0.50 mg/L

Detection Limit (W): 0.01 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0035

Sw(B-C): 0.0020

Control Samples:

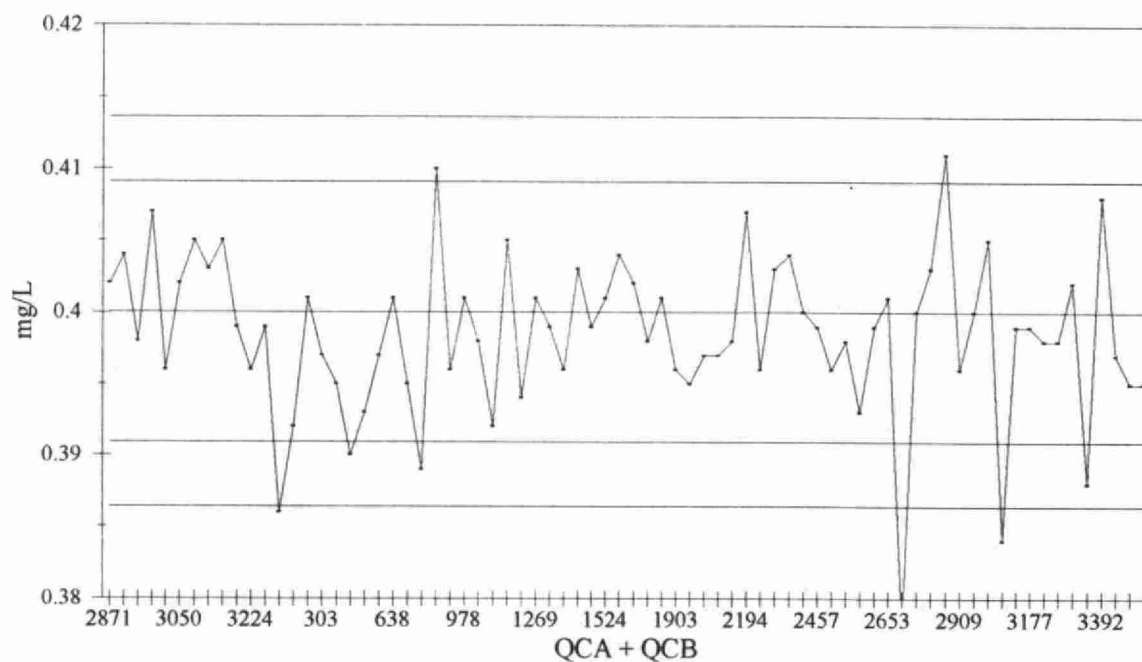
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	74	0.32	0.3198	-0.0002	0.0041
QCB:	74	0.08	0.0787	-0.0013	0.0027
QCC:	74	0.032	0.0309	-0.0011	0.0022
QCA+QCB:	74	0.4	0.3985	-0.0015	0.0056
QCA-QCB:	74	0.24	0.2411	0.0011	0.0039
QCB+QCC:	74	0.112	0.1096	-0.0024	0.0045
QCB-QCC:	74	0.048	0.0478	-0.0002	0.0019

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
123	0.0 - 0.10	0.0229	0.0020
36	0.10 - 0.25	0.1774	0.0043
29	0.25 - 0.50	0.3254	0.0054

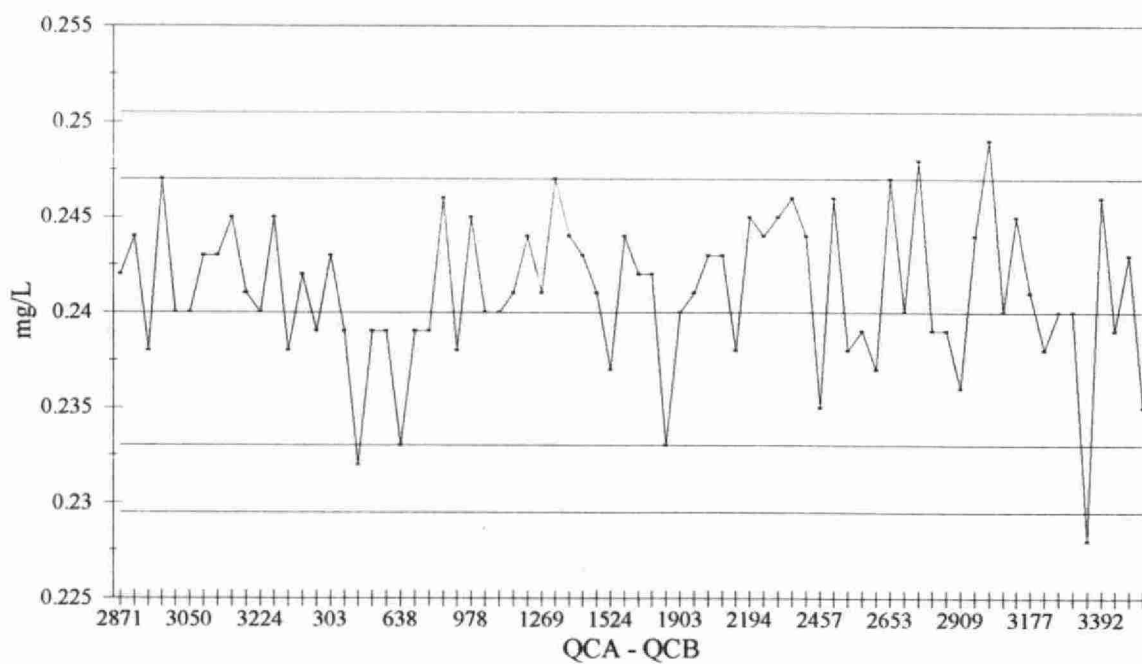
Nitrate

Quality Control Data: 950101 to 951231



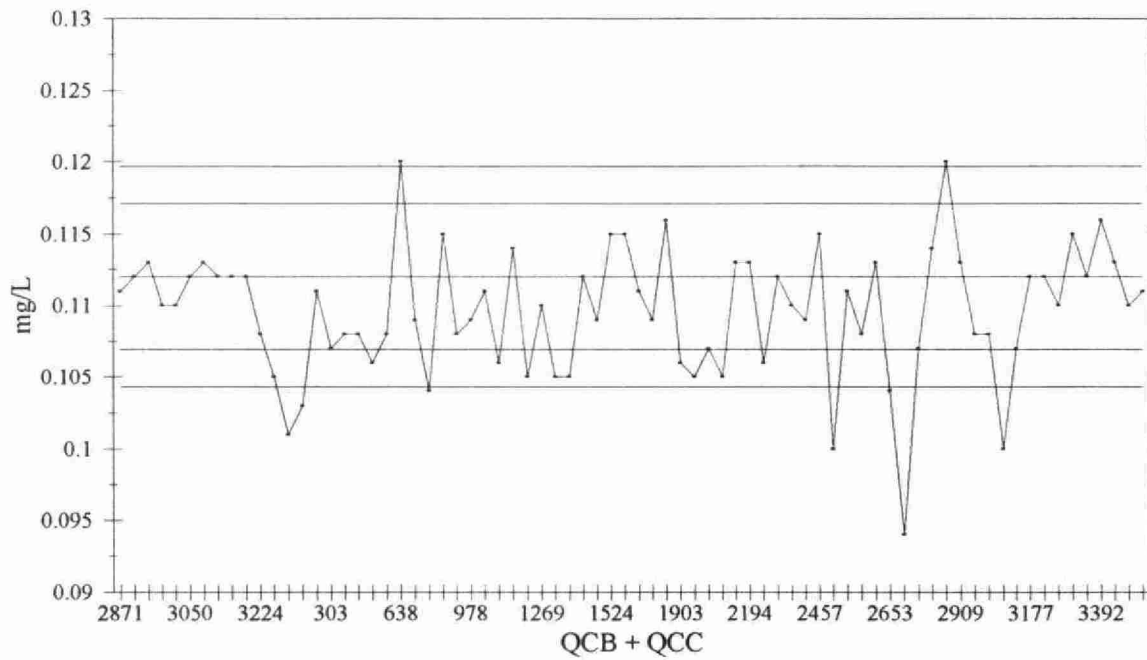
Nitrate

Quality Control Data: 950101 to 951231



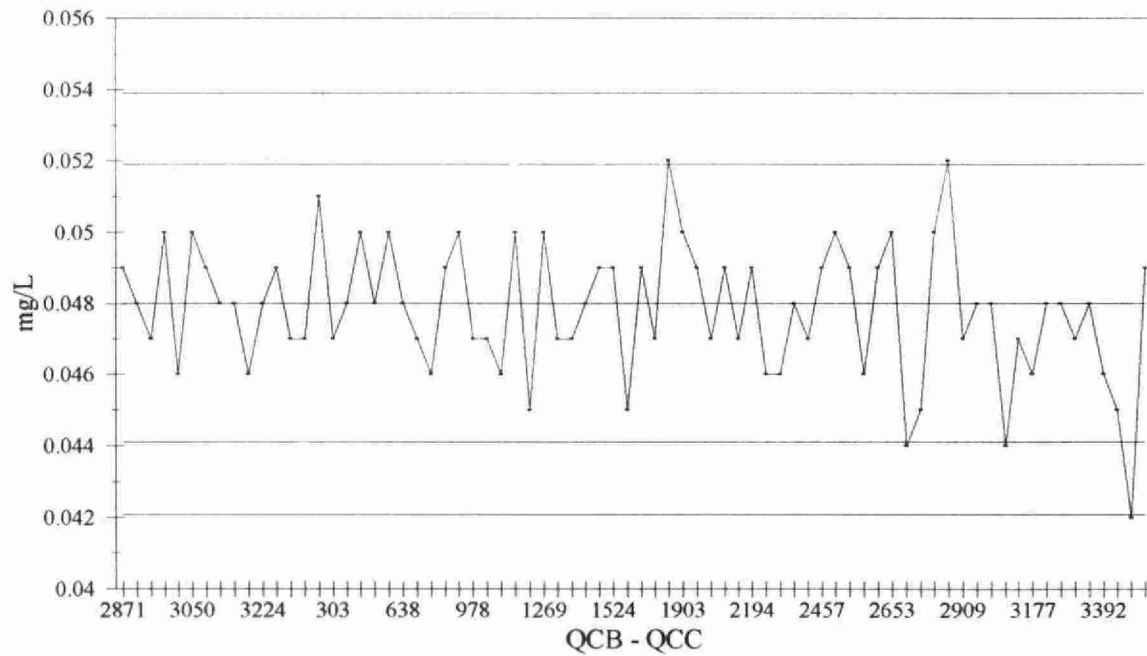
Nitrate

Quality Control Data: 950101 to 951231



Nitrate

Quality Control Data: 950101 to 951231



Phosphate - Ortho

Quality Control Data from 940101 to 941231

Analytical Range: 0.1 mg/L

Detection Limit (W): 0.001 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0012

Sw(B-C): 0.0006

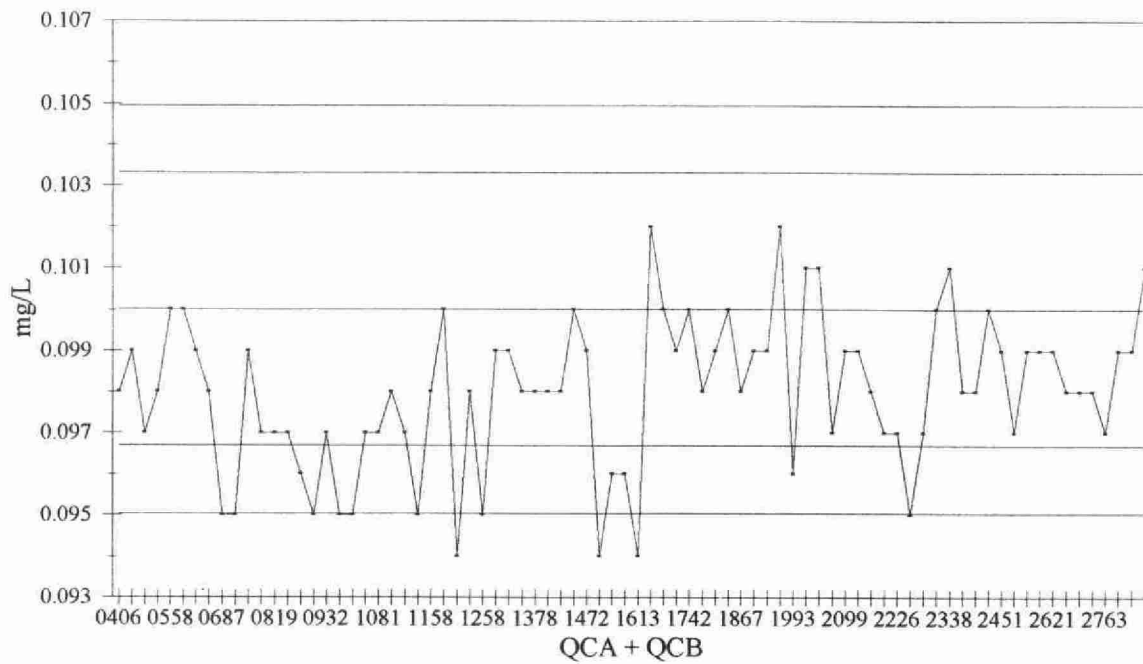
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	80	0.08	0.0790	-0.0010	0.0014
QCB:	80	0.02	0.0190	-0.0010	0.0007
QCC:	80	0.008	0.0073	-0.0007	0.0005
QCA+QCB:	80	0.1	0.0980	-0.0020	0.0019
QCA-QCB:	80	0.06	0.0601	0.0001	0.0013
QCB+QCC:	80	0.028	0.0263	-0.0017	0.0011
QCB-QCC:	80	0.012	0.0117	-0.0003	0.0006

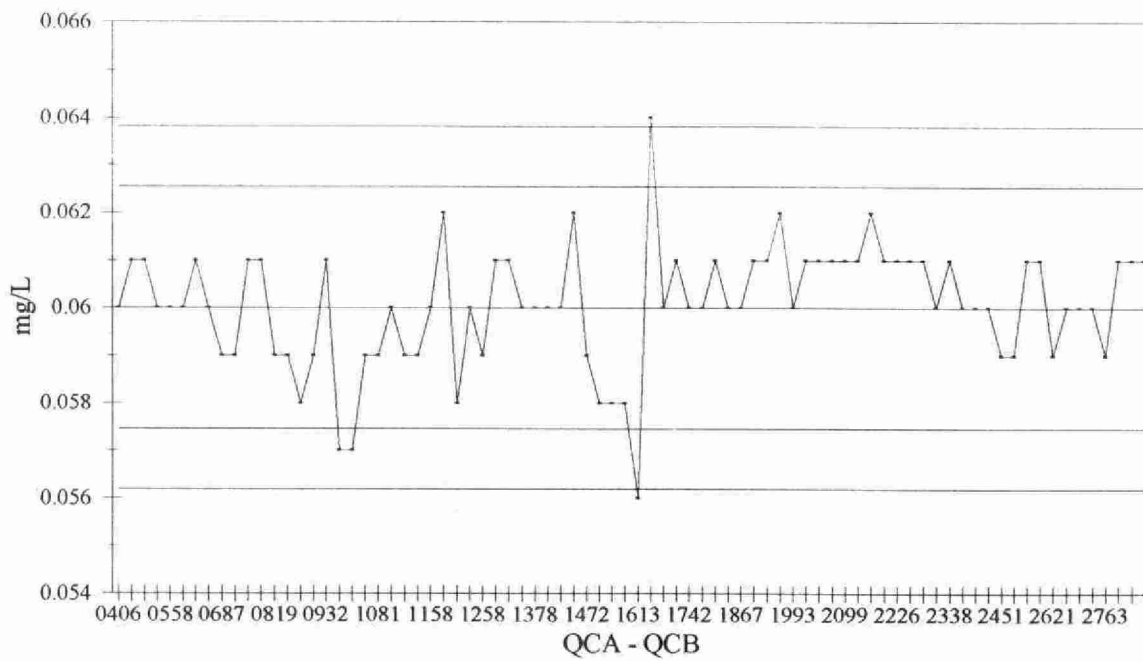
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
193	0.0 - 0.02	0.0040	0.0008
29	0.02 - 0.05	0.0340	0.0011
6	0.05 - 0.10	0.0680	0.0018

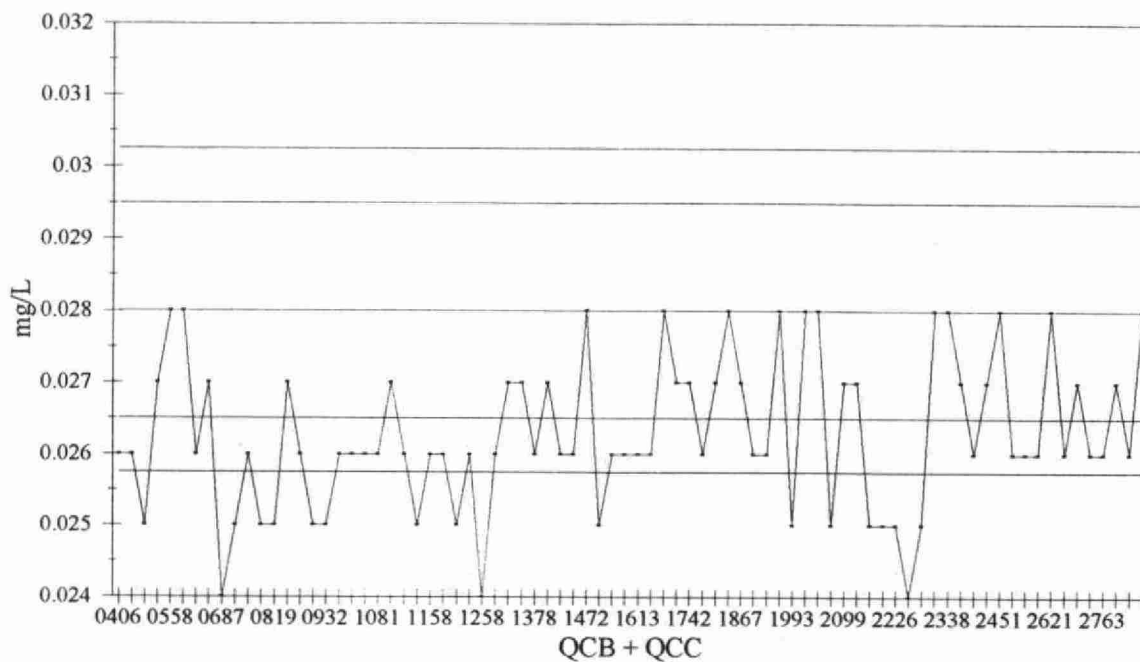
Phosphate - Ortho Quality Control Data: 940101 to 941231



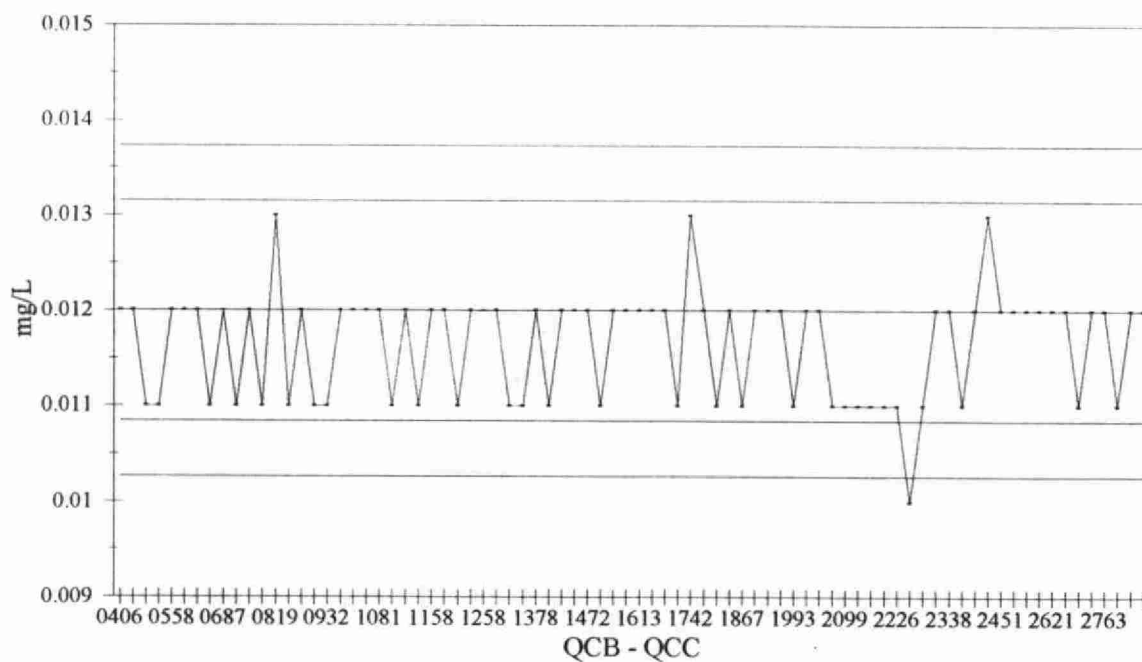
Phosphate - Ortho Quality Control Data: 940101 to 941231



Phosphate - Ortho Quality Control Data: 940101 to 941231



Phosphate - Ortho Quality Control Data: 940101 to 941231



Phosphate - Ortho**Quality Control Data from 950101 to 951231**

Analytical Range: 0.1 mg/L

Detection Limit (W): 0.001 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0013

Sw(B-C): 0.0006

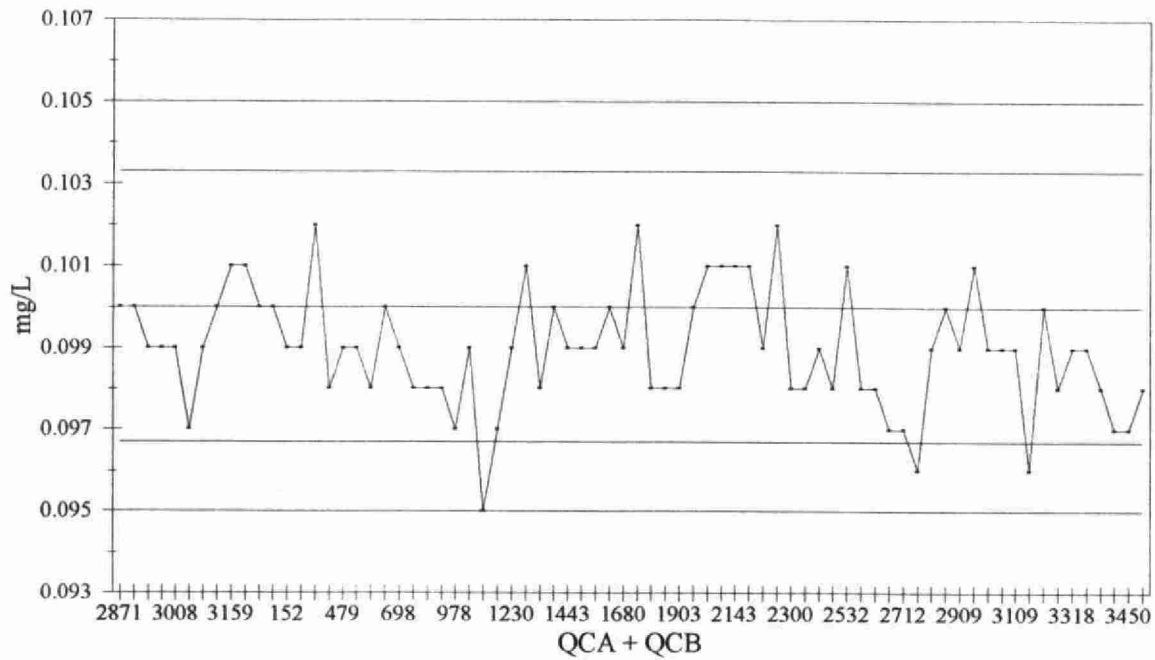
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	74	0.08	0.0798	-0.0002	0.0010
QCB:	74	0.02	0.0192	-0.0008	0.0007
QCC:	74	0.008	0.0075	-0.0005	0.0005
QCA+QCB:	74	0.1	0.0990	-0.0010	0.0014
QCA-QCB:	74	0.06	0.0606	0.0006	0.0009
QCB+QCC:	74	0.028	0.0267	-0.0013	0.0010
QCB-QCC:	74	0.012	0.0116	-0.0004	0.0007

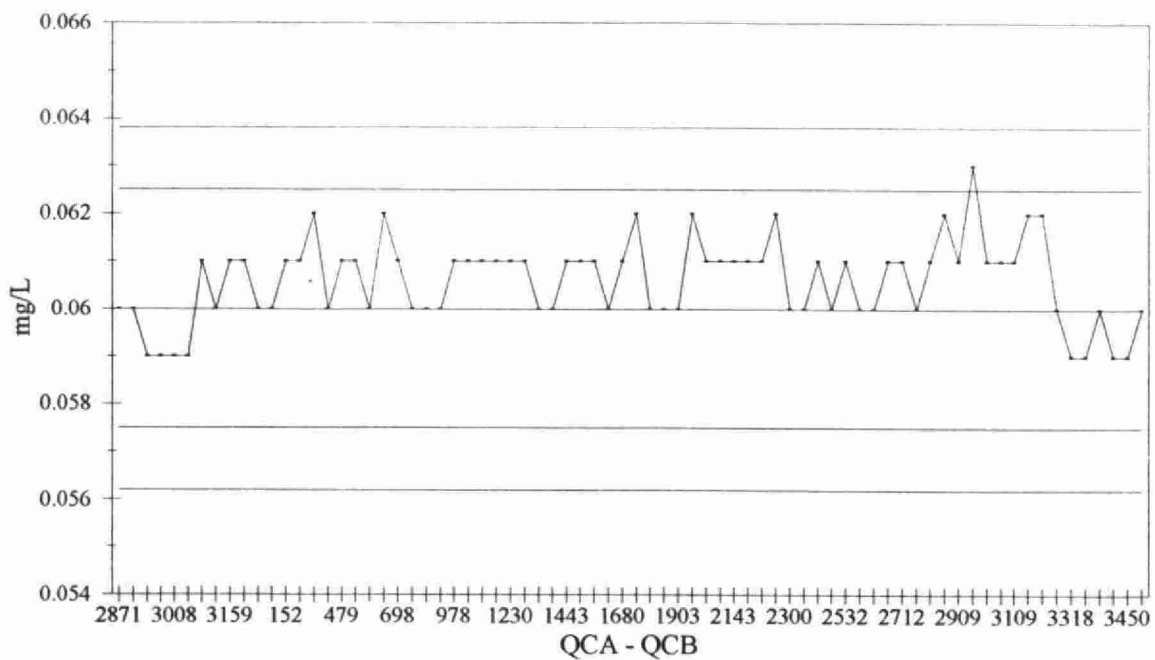
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
189	0.0 - 0.02	0.0043	0.0006
16	0.02 - 0.05	0.0330	0.0012
10	0.05 - 0.10	0.0676	0.0015

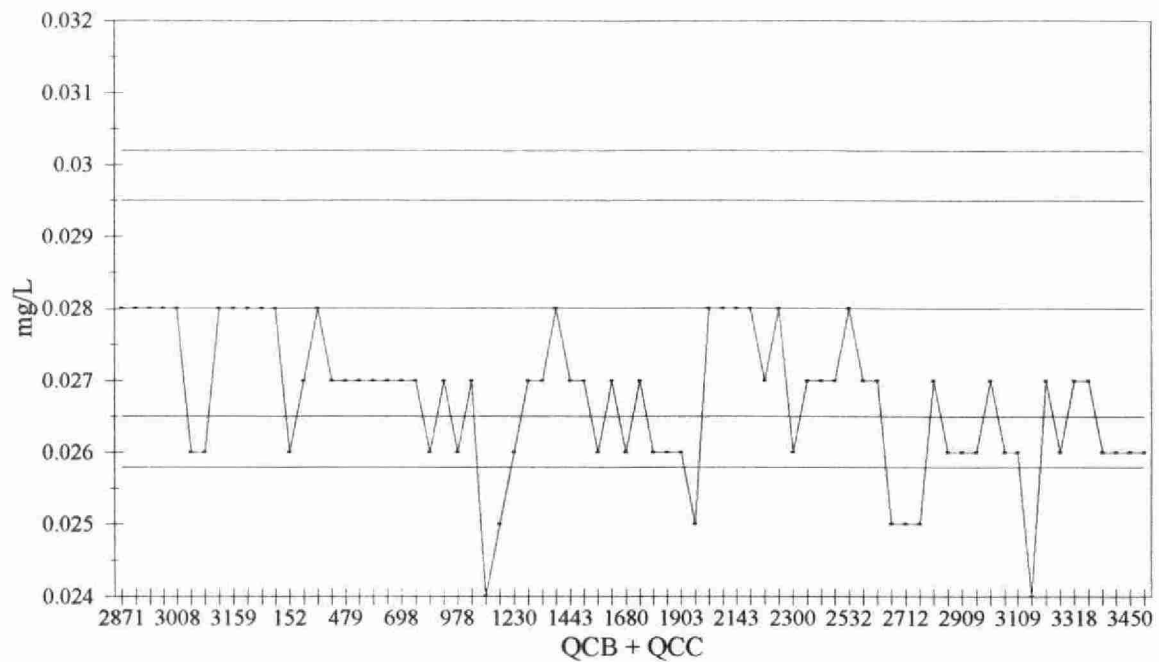
Phosphate - Ortho Quality Control Data: 950101 to 951231



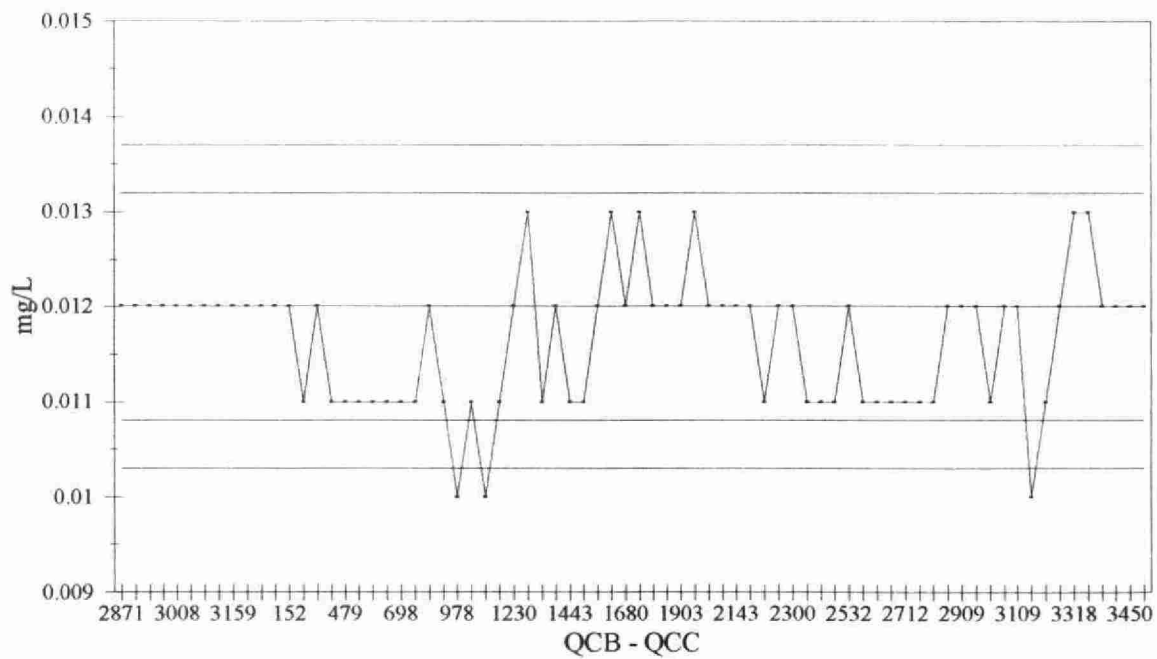
Phosphate - Ortho Quality Control Data: 950101 to 951231



Phosphate - Ortho Quality Control Data: 950101 to 951231



Phosphate - Ortho Quality Control Data: 950101 to 951231



SULPHATE

IDENTIFICATION:

Method Title: The Determination of Sulphate in Surface Water, Domestic Water, Precipitation, Sewage, Industrial Waste and Leachates by Automated Ion Chromatography (IC).

Method Number: E6032B

Method Introduced: 1978

Current Revision: March 2, 1995

PARAMETER: Parameter Name

W(units)

T(units)

Sulphate

.5 mg/L

2.5 mg/L

SAMPLE MATRICES:

Sample matrices analyzed are surface water, domestic water, precipitation, snow, industrial effluent and landfill leachate.

ANALYTICAL PROCEDURE:

Using a sodium bicarbonate/sodium carbonate eluent, sulphate is separated with automated ion suppression chromatography utilizing a conductivity detector, for a response vs. time chromatogram.

CONTROLS AND QUALITY ASSURANCE:

Controls: Long Term Blank
Quality Control Solutions A, B and C

Drift: Sensitivity Checks after every 20 samples

Duplicates: 1 for every 15 samples

Interlabs: CAEAL Certified
Ontario Ministry of the Environment and Energy Performance Evaluation Study
LRTAP and GLAP participant

Reporting: Maximum Significant Figures: 2
Units: mg/L as SO₄

Sulphate

Quality Control Data from 940101 to 941231

Analytical Range: 50.0 mg/L

Detection Limit (W): 0.5 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.3447

Sw(B-C): 0.1977

Control Samples:

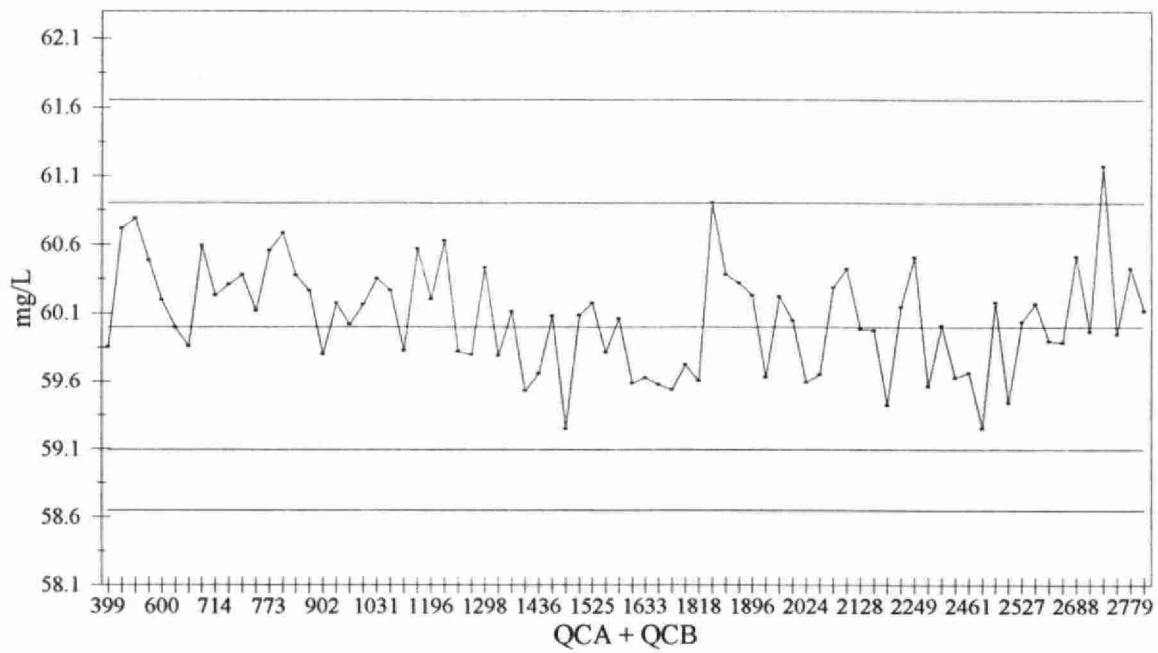
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	78	45	45.1275	0.1275	0.2492
QCB:	78	15	14.9385	-0.0615	0.2581
QCC:	78	5	4.9484	-0.0516	0.0987
QCA+QCB:	78	60	60.0660	0.0660	0.3917
QCA-QCB:	78	30	30.1890	0.1890	0.3225
QCB+QCC:	78	20	19.8869	-0.1131	0.2779
QCB-QCC:	78	10	9.9901	-0.0099	0.2748

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
106	0 - 10	5.4070	0.0898
66	10 - 25	15.2960	0.1673
15	25 - 50	34.8190	0.3526

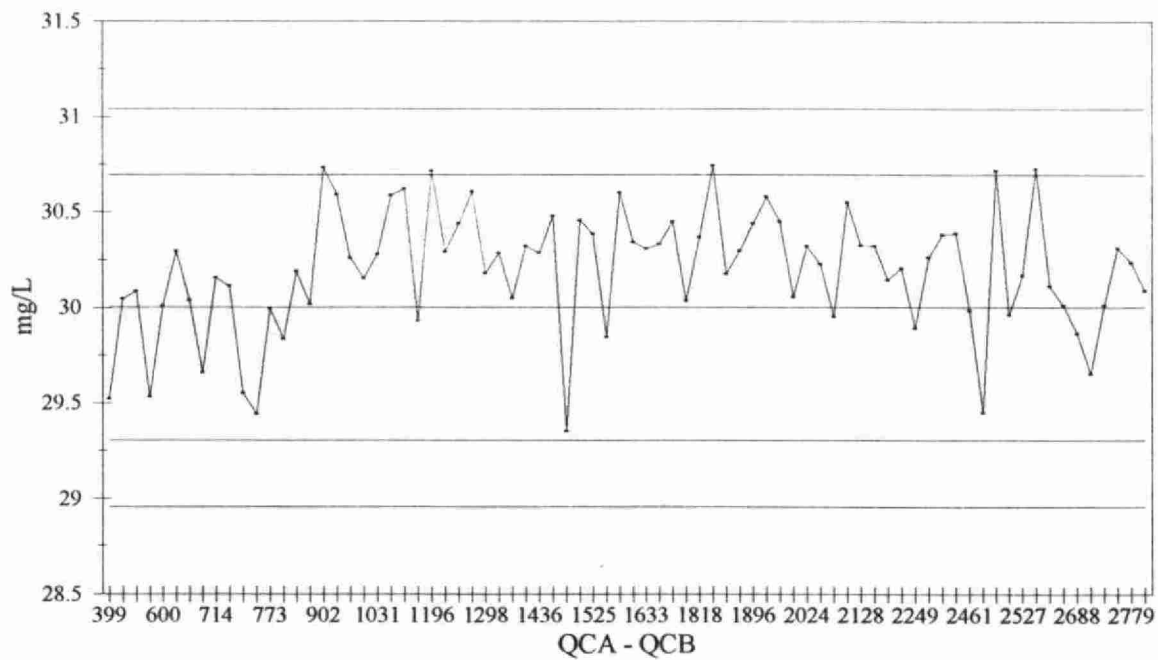
Sulphate

Quality Control Data: 940101 to 941231



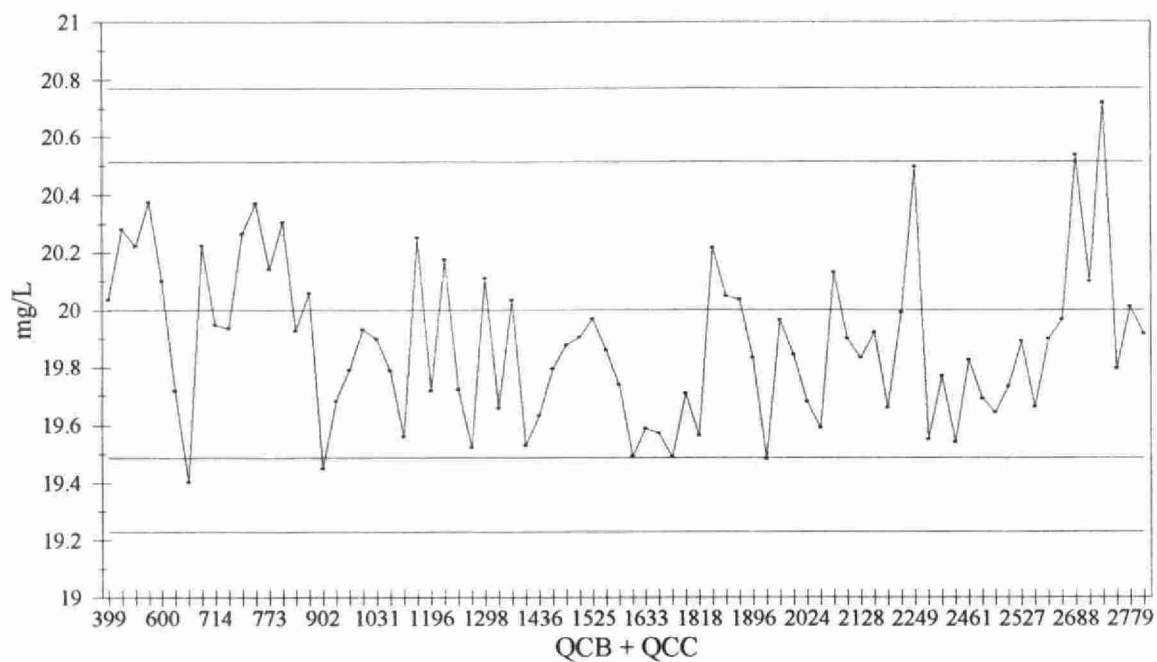
Sulphate

Quality Control Data: 940101 to 941231



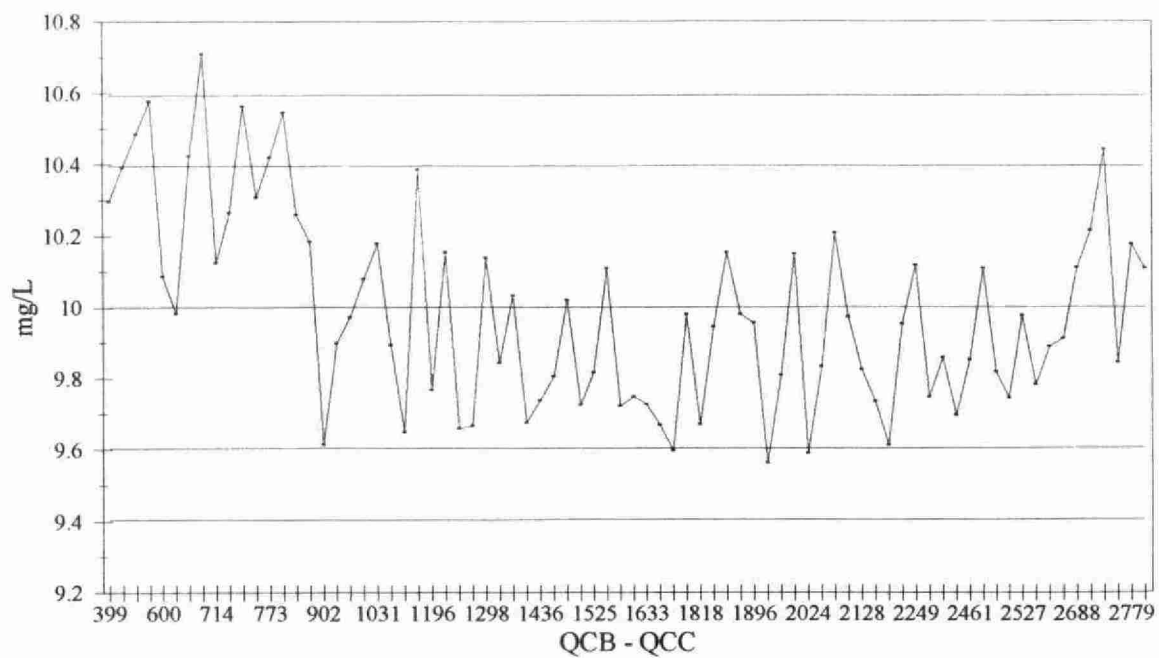
Sulphate

Quality Control Data: 940101 to 941231



Sulphate

Quality Control Data: 940101 to 941231



Sulphate

Quality Control Data from 950101 to 951231

Analytical Range: 50.0 mg/L

Detection Limit (W): 0.5 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.3225

Sw(B-C): 0.2748

Control Samples:

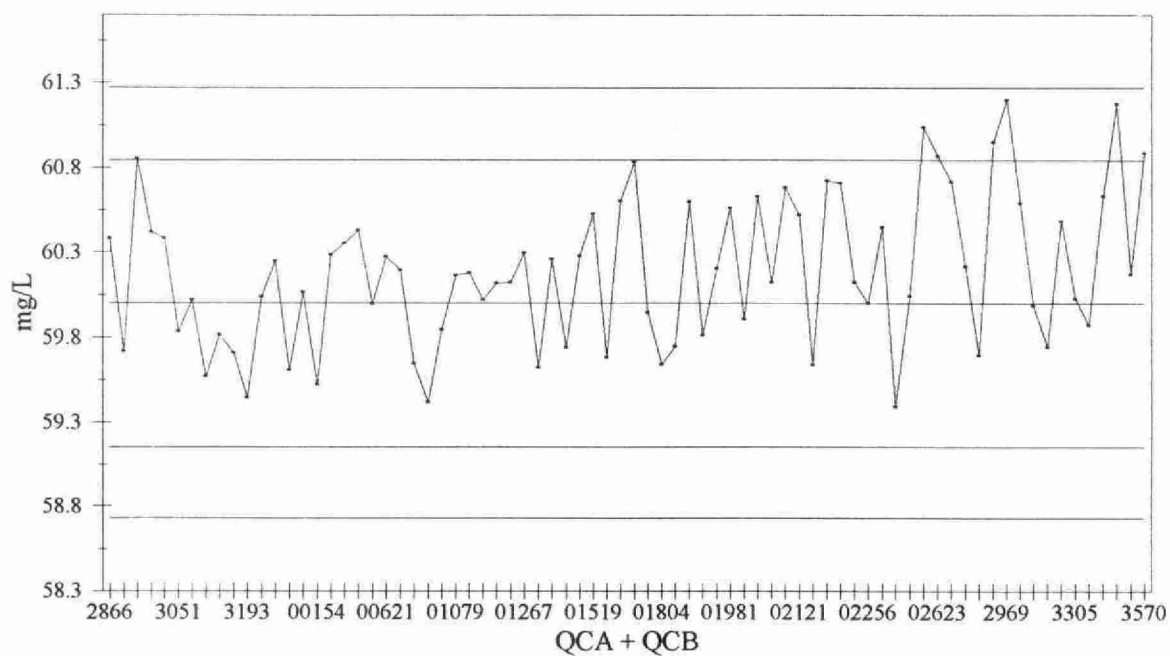
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	76	45	45.2485	0.2485	0.3027
QCB:	76	15	14.9387	-0.0613	0.2549
QCC:	76	5	4.8099	-0.1901	0.1410
QCA+QCB:	76	60	60.1872	0.1872	0.4423
QCA-QCB:	76	30	30.3097	0.3097	0.3429
QCB+QCC:	76	20	19.7487	-0.2513	0.3064
QCB-QCC:	76	10	10.1288	0.1288	0.2754

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
82	0 - 10	4.4732	0.0509
51	10 - 25	16.4377	0.2080
24	25 - 50	37.2517	0.2125

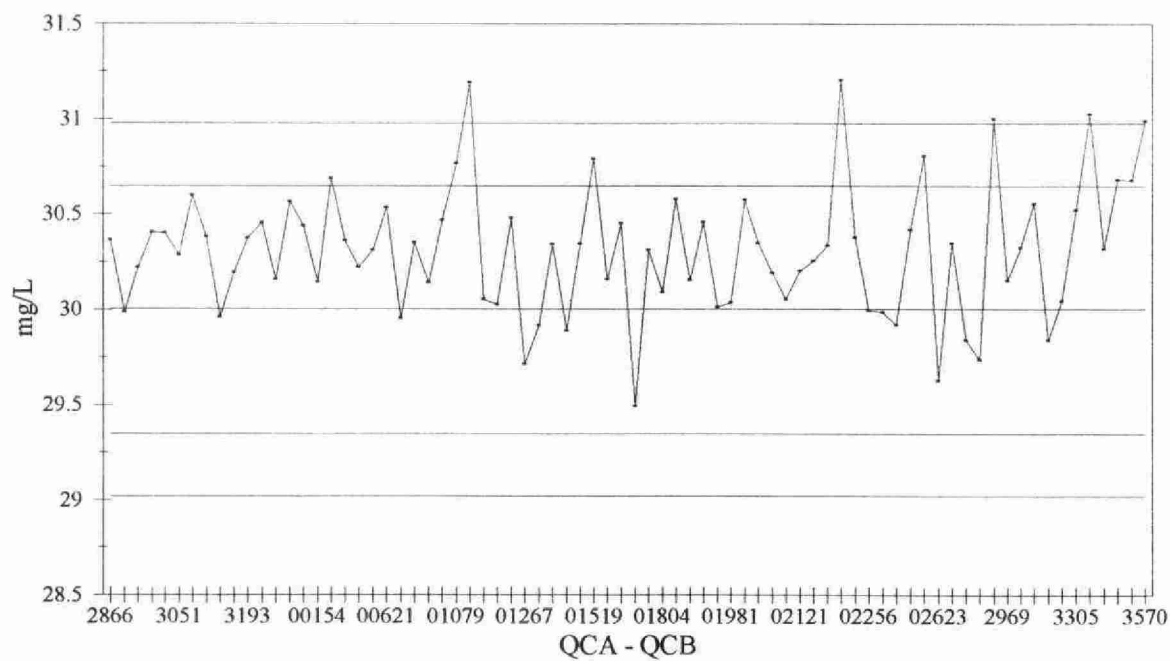
Sulphate

Quality Control Data: 950101 to 951231



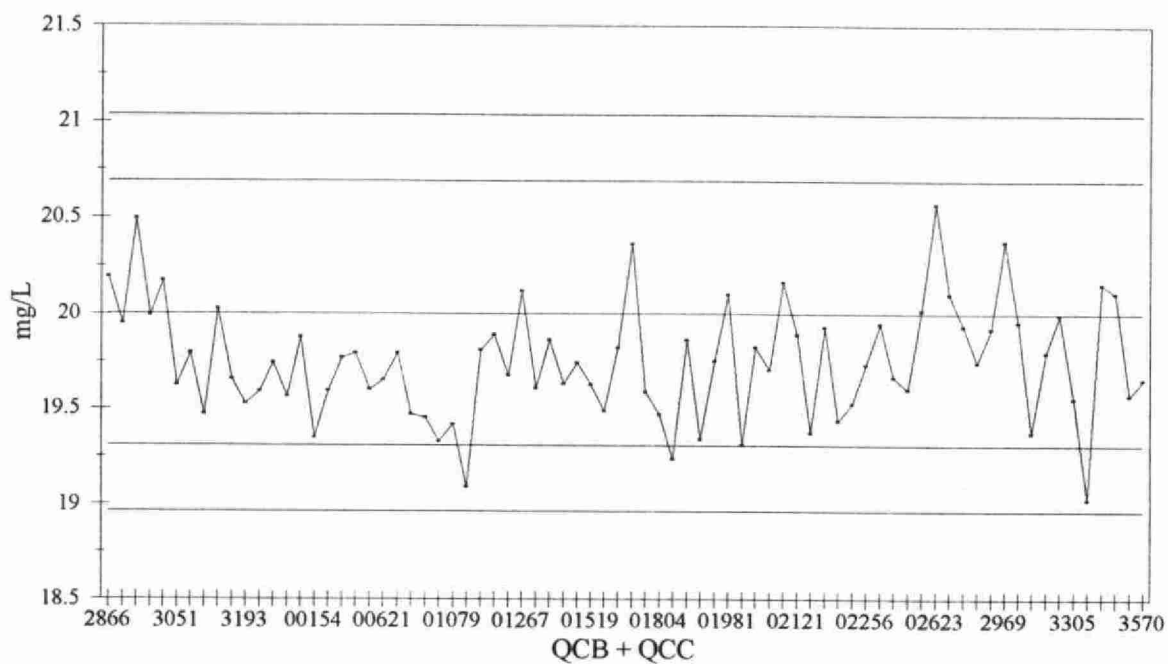
Sulphate

Quality Control Data: 950101 to 951231



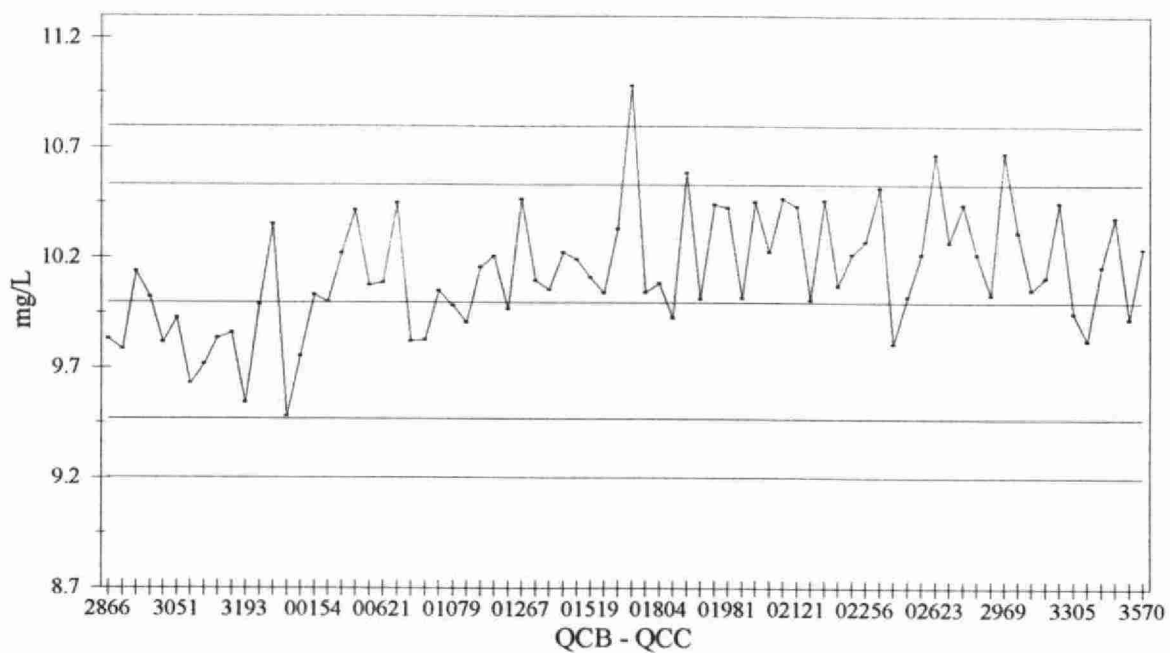
Sulphate

Quality Control Data: 950101 to 951231



Sulphate

Quality Control Data: 950101 to 951231



TOTAL NUTRIENTS

IDENTIFICATION:

Method Title: The Determination of Total Kjeldahl Nitrogen and Total Phosphorus in Water, Precipitation, Sewages, Leachates and Industrial Effluents and the Determination of Low-Level Total Phosphorus in Water by Colourimetry.

Method Number: E6026A

Method Introduced: 1978

Current Revision: March 2, 1995

PARAMETER:	Parameter Name	W(units)	T(units)
	Total Kjeldahl Nitrogen	.01 mg/L	.05 mg/L
	Total Phosphorus	.001 mg/L	.005 mg/L

SAMPLE MATRICES:

Sample matrices analyzed are surface and domestic waters, precipitation, sewages, landfill leachates and industrial effluents

ANALYTICAL PROCEDURE:

Total Kjeldahl Nitrogen: Samples are digested stepwise in a sulphuric acid-mercuric oxide-potassium sulphate media using two block digesters set at 200°C and 360°C. The orthophosphate content in the digestate is determined by the formation of a reduced phospho-antimonyl-molybdate complex using ascorbic acid as the reducing agent.

Total Phosphorus: Samples are digested in a sulphuric acid-mercuric oxide-potassium sulphate media using two block digesters set at 200°C and 360°C. The digested sample is then neutralized and analyzed for ammonia species using phenate-hypochlorite colourimetry which determines both organic and ammonia forms of nitrogen.

CONTROLS AND QUALITY ASSURANCE:

Controls: Long Term Blank
Quality Control Solutions A and B

Drift: Blank after every 10 samples
Sensitivity Checks after every 20 samples

Duplicates: 1 for every 15 samples

Interlabs: CAEAL Certified
Ontario Ministry of the Environment and Energy Performance Evaluation Study
LRTAP and GLAP participant

Reporting: Maximum Significant Figures: 3
Units: mg/L

Total Kjeldahl Nitrogen

Quality Control Data from 940101 to 941231

Analytical Range: 1.6 mg/L

Detection Limit (W): 0.01 mg/l

Sw used to calculate control limits -

Sw(A-B): 0.0124

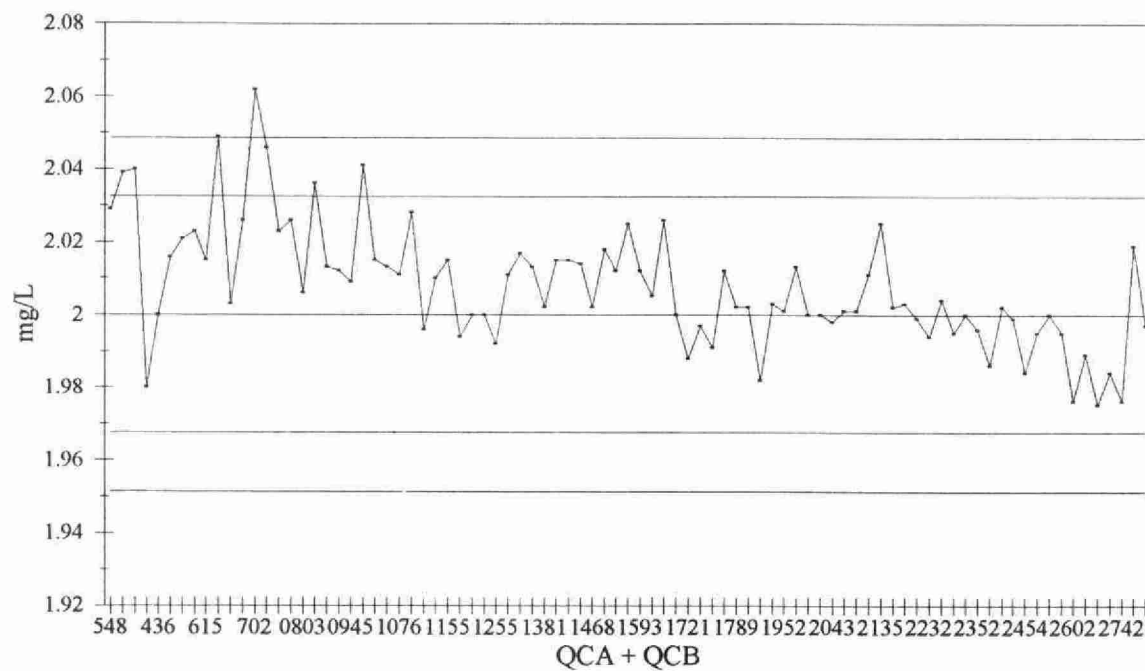
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	87	1.5	1.5055	0.0055	0.0122
QCB:	87	0.5	0.5022	0.0022	0.0064
QCA+QCB:	87	2	2.0077	0.0077	0.0167
QCA-QCB:	87	1	1.0033	0.0033	0.0100

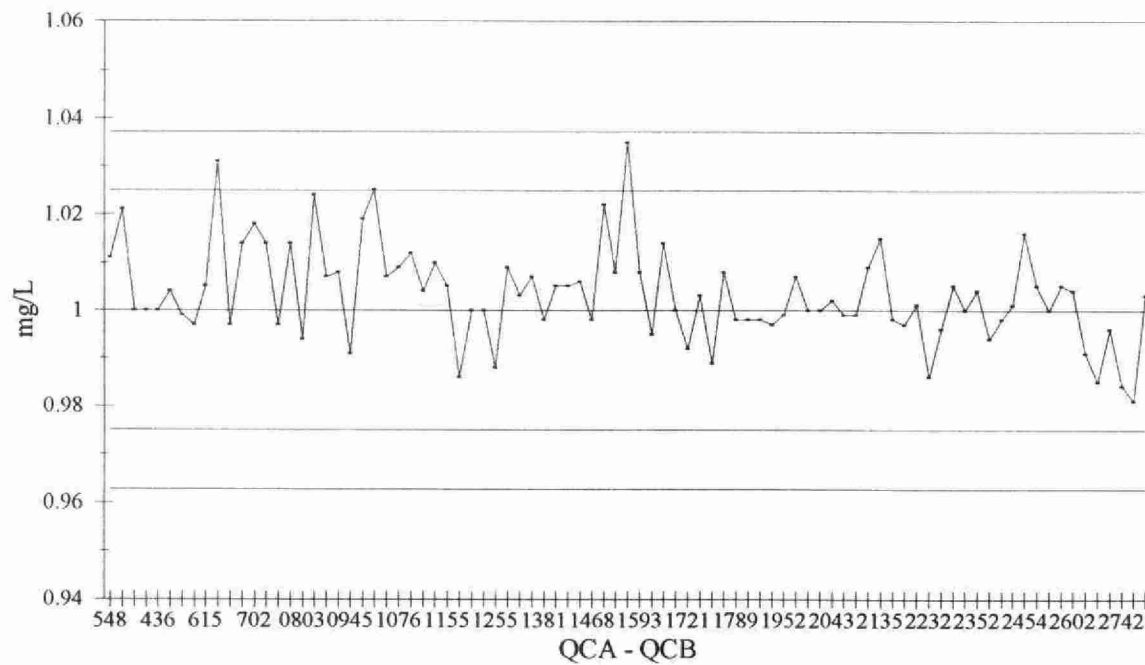
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
130	0.00 - 0.32	0.1540	0.0170
79	0.32 - 0.80	0.5210	0.0148
23	0.80 - 1.60	1.0050	0.0252

Total Kjeldahl Nitrogen Quality Control Data: 940101 to 941231



Total Kjeldahl Nitrogen Quality Control Data: 940101 to 941231



Total Kjeldahl Nitrogen

Quality Control Data from 950101 to 951231

Analytical Range: 1.6 mg/L

Detection Limit (W): 0.01 mg/l

Sw used to calculate control limits -

Sw(A-B): 0.0100

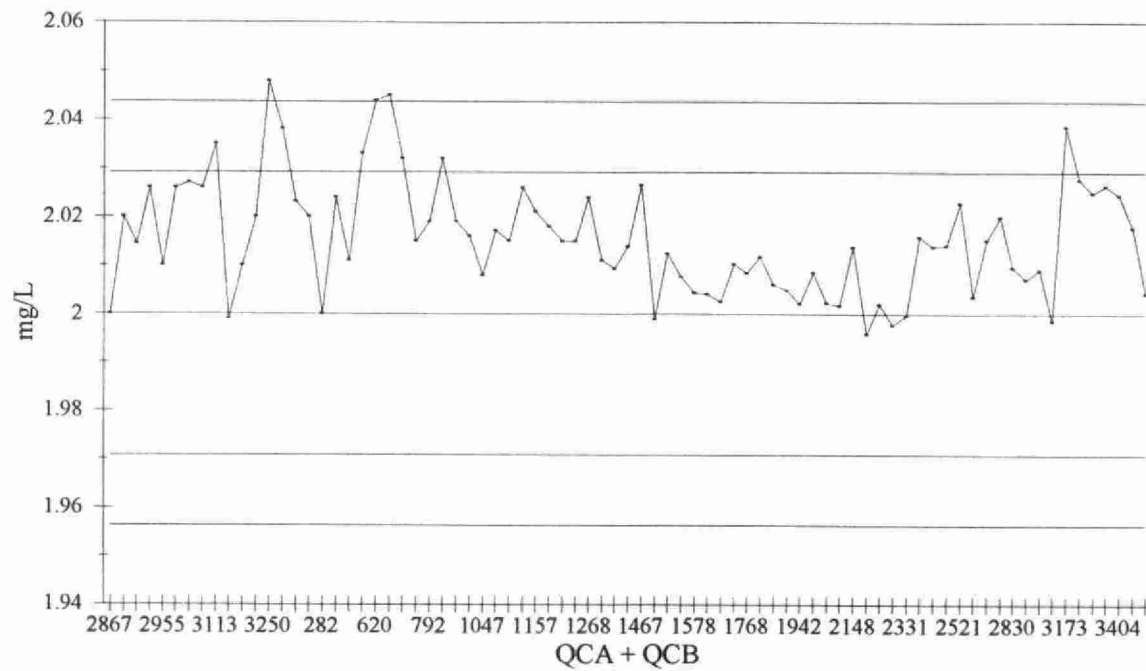
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	79	1.5	1.5068	0.0068	0.0093
QCB:	79	0.5	0.5089	0.0089	0.0069
QCA+QCB:	79	2	2.0157	0.0157	0.0119
QCA-QCB:	79	1	0.9979	-0.0021	0.0112

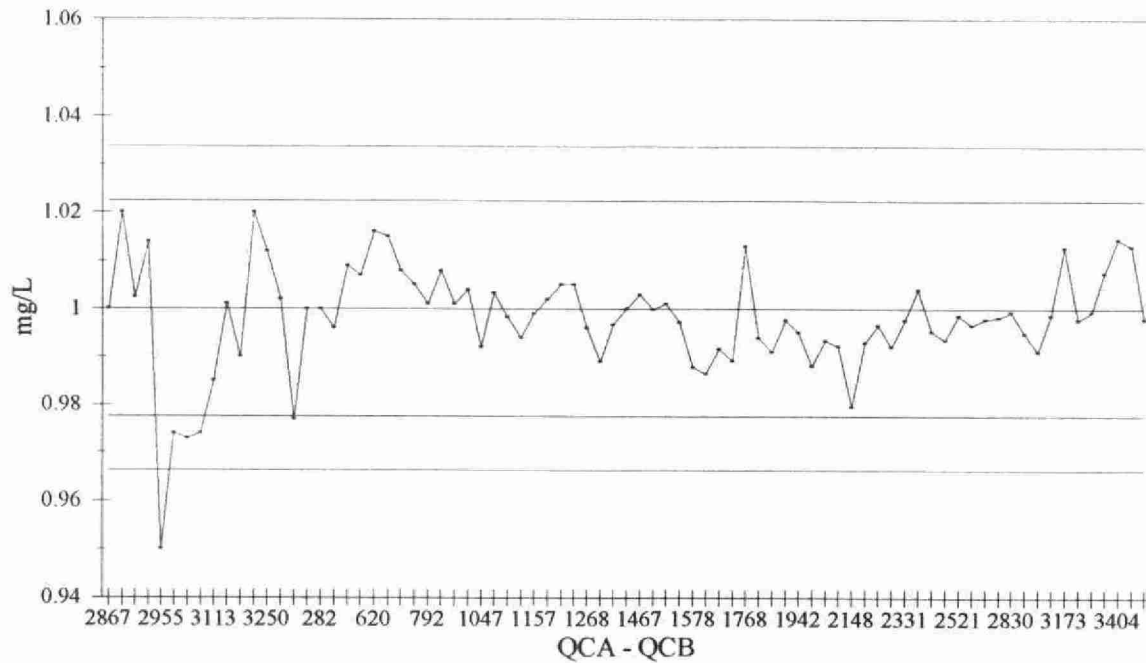
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
106	0.00 - 0.32	0.1468	0.0075
62	0.32 - 0.80	0.4951	0.0168
26	0.80 - 1.60	1.0374	0.0413

Total Kjeldahl Nitrogen Quality Control Data: 950101 to 951231



Total Kjeldahl Nitrogen Quality Control Data: 950101 to 951231



Phosphorus - Total

Quality Control Data from 940101 to 941231

Analytical Range: 0.16 mg/L

Detection Limit (W): 0.001 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0016

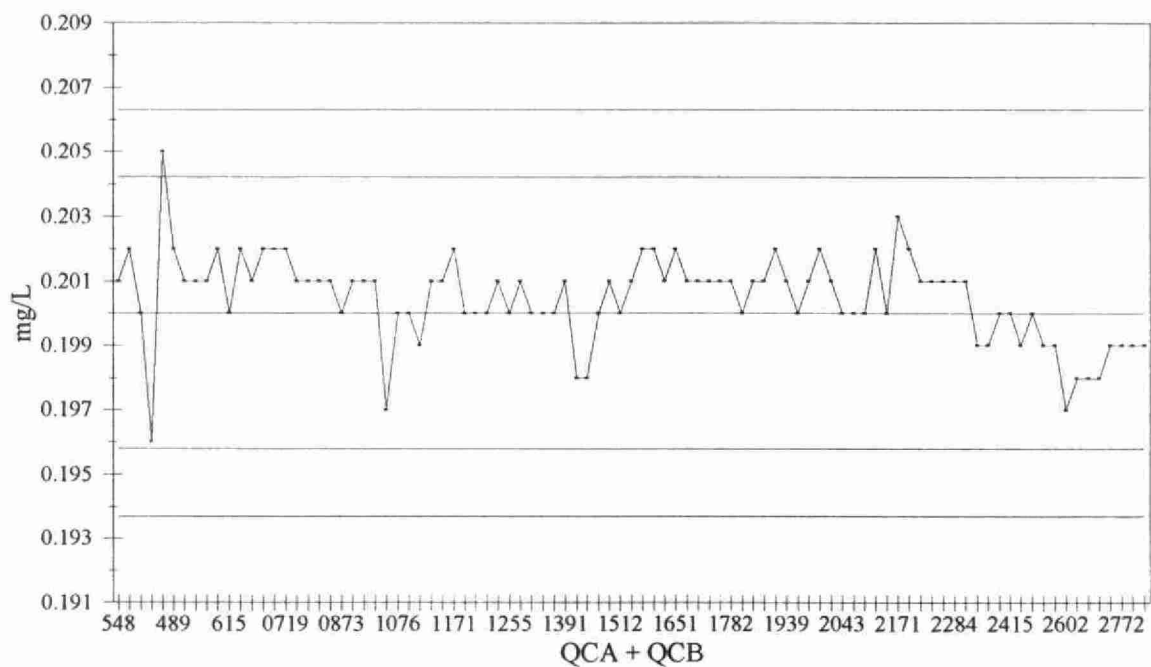
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	93	0.15	0.1507	0.0007	0.0010
QCB:	93	0.05	0.0498	-0.0002	0.0006
QCA+QCB:	93	0.2	0.2005	0.0005	0.0014
QCA-QCB:	93	0.1	0.1009	0.0009	0.0009

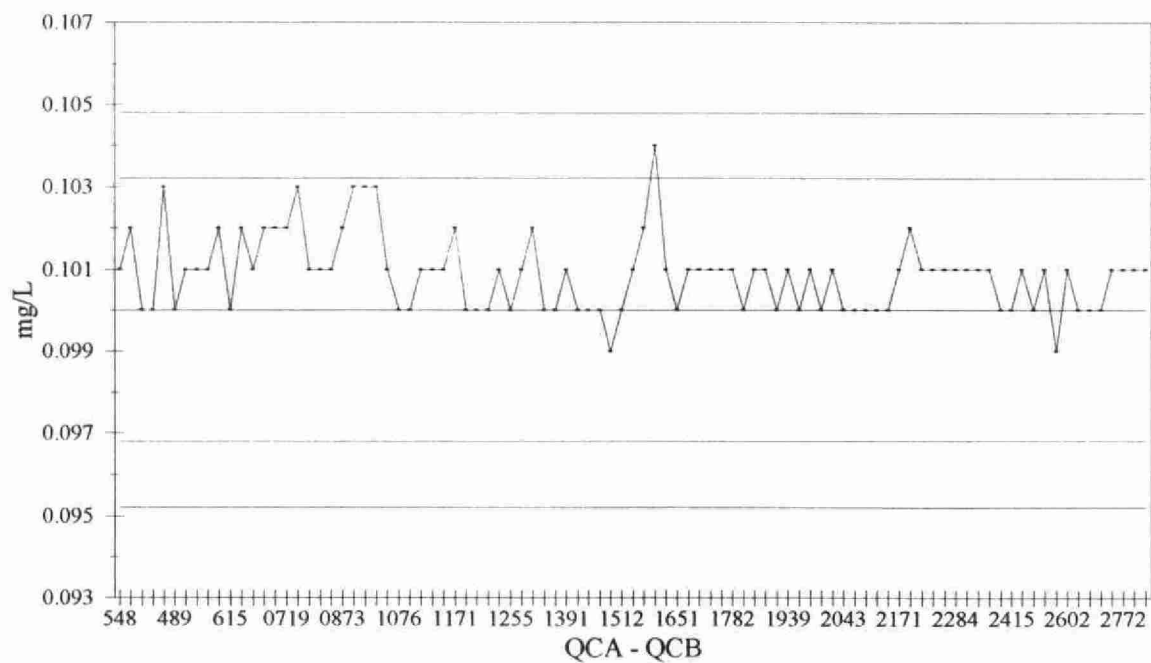
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
171	0.000 - 0.032	0.0110	0.0015
53	0.032 - 0.080	0.0520	0.0029
25	0.080 - 0.160	0.1090	0.0035

Phosphorus - Total Quality Control Data: 940101 to 941231



Phosphorus - Total Quality Control Data: 940101 to 941231



Phosphorus - Total

Quality Control Data from 950101 to 951231

Analytical Range: 0.16 mg/L

Detection Limit (W): 0.001 mg/L

Sw used to calculate control limits -

Sw(A-B): 0.0009

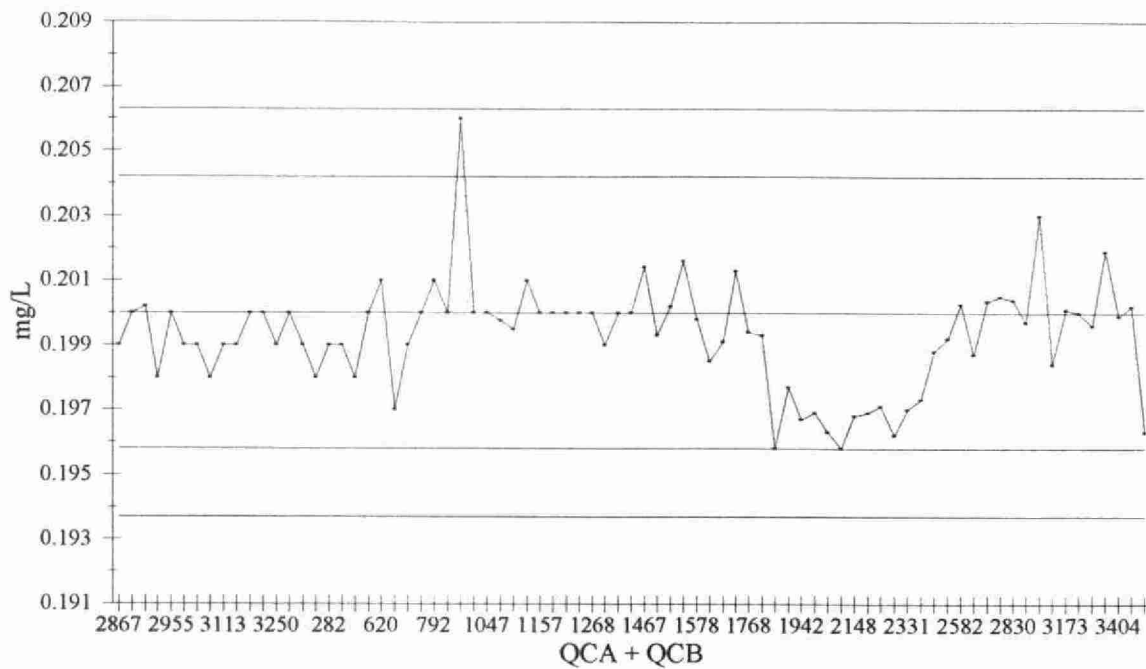
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	79	0.15	0.1495	-0.0005	0.0009
QCB:	79	0.05	0.0498	-0.0002	0.0011
QCA+QCB:	79	0.2	0.1993	-0.0007	0.0017
QCA-QCB:	79	0.1	0.0998	-0.0002	0.0011

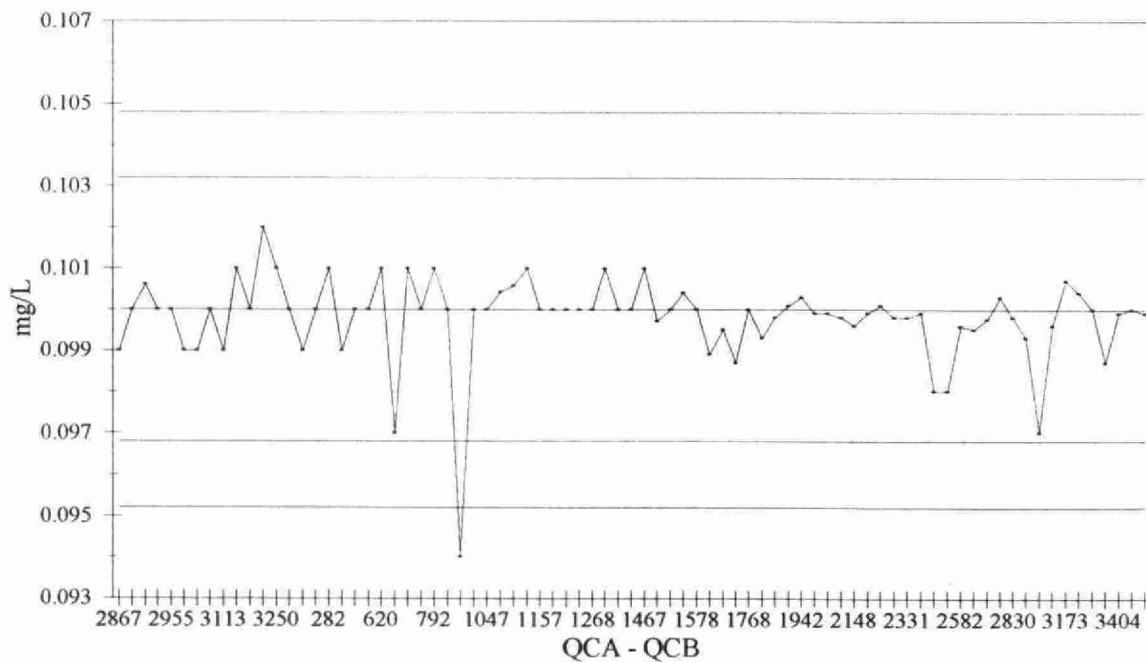
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
171	0.000 - 0.032	0.0110	0.0015
53	0.032 - 0.080	0.0520	0.0029
25	0.080 - 0.160	0.1090	0.0035

Phosphorus - Total Quality Control Data: 950101 to 951231



Phosphorus - Total Quality Control Data: 950101 to 951231



TURBIDITY

IDENTIFICATION:

Method Title: The Determination of Turbidity in Water, Landfill and Industrial Waste Samples by Nephelometry.

Method Number: E6011A

Method Introduced: 1978

Current Revision: Jan. 01, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	Turbidity	.02 FTU	.10 FTU

SAMPLE MATRICES:

Sample matrices analyzed are surface water, domestic water, precipitation, industrial effluent and landfill leachate.

ANALYTICAL PROCEDURE:

Samples are placed in the turbidimeter and results in FTU are read directly from the digital output.

CONTROLS AND QUALITY ASSURANCE:

Controls: Sealed Hach 'Gelex' Standards A and B
Sealed Hach 'Gelex' Standards Stray Light and High Instrument Check

Drift: Sealed Hach 'Gelex' Standards A and B at end of run

Duplicates: 1 for every 15 samples

Reporting: Maximum Significant Figures: 2
Units: FTU

Turbidity

Quality Control Data from 940101 to 941231

Analytical Range: 10 FTU

Detection Limit (W): .02 FTU

Sw used to calculate control limits -

Sw(A-B): 0.0615

Control Samples:

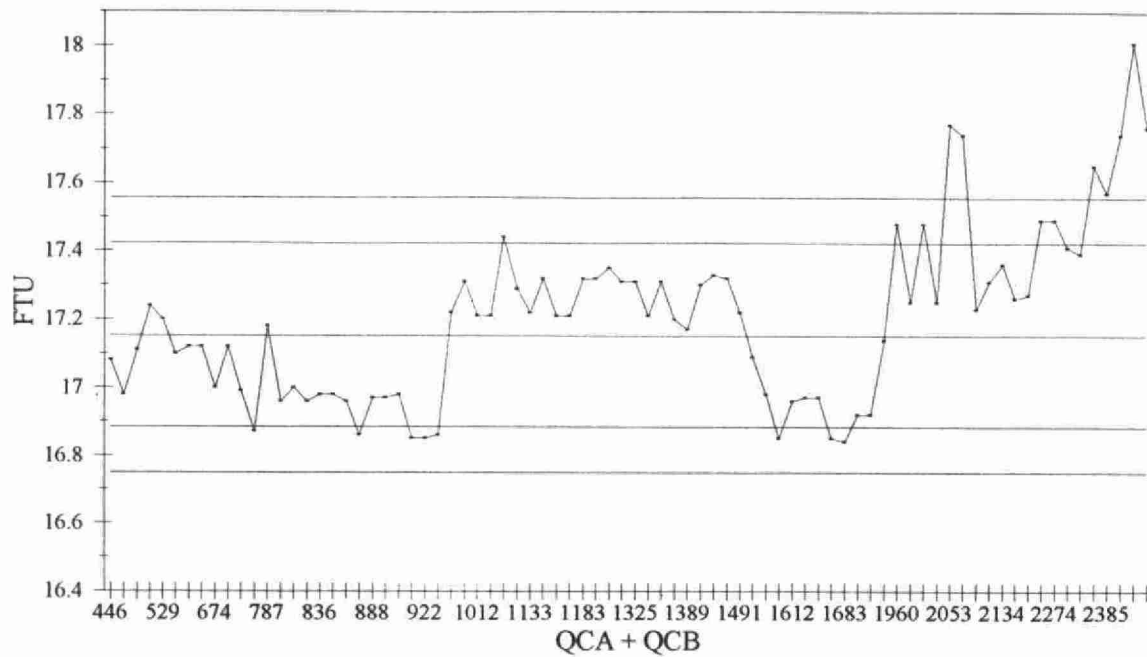
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	80	15.65	15.7050	0.0550	0.2221
QCB:	80	1.5	1.4950	-0.0050	0.0418
QCA+QCB:	80	17.15	17.2000	0.0500	0.2489
QCA-QCB:	80	14.15	14.2100	0.0600	0.2006

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
160	0 - 2	0.8264	0.0372
29	2 - 5	3.4276	0.1266
21	5 - 10	7.2595	0.2493

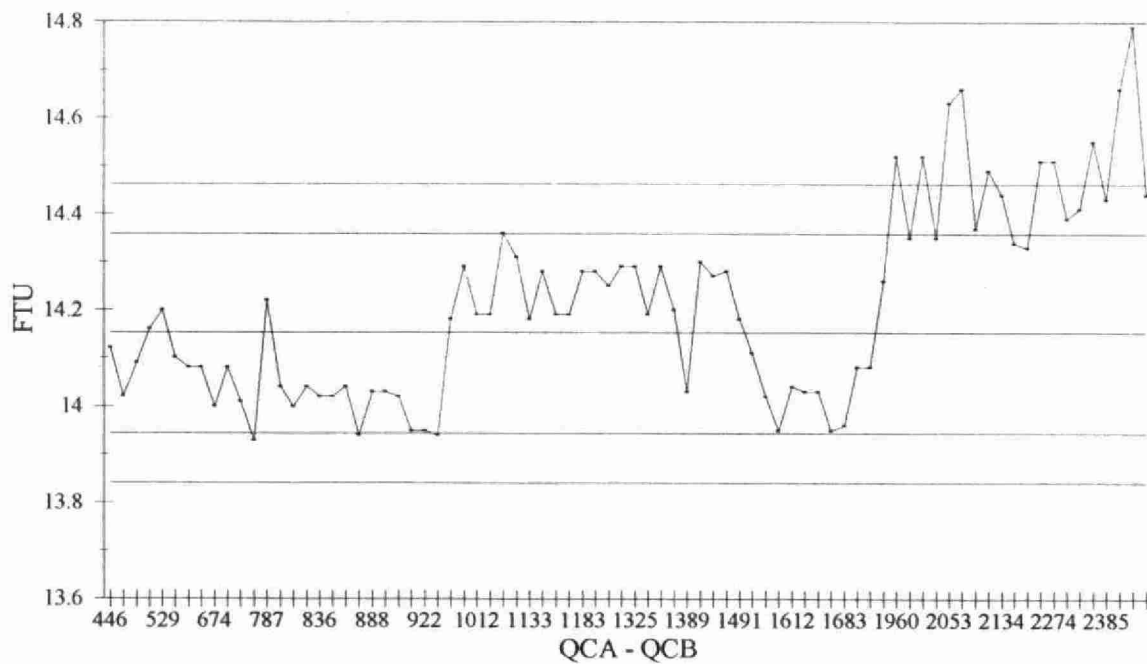
Turbidity

Quality Control Data: 940101 to 941231



Turbidity

Quality Control Data: 940101 to 941231



Turbidity

Quality Control Data from 950101 to 951231

Analytical Range: 10 FTU

Detection Limit (W): .02 FTU

Sw used to calculate control limits -

Sw(A-B): 0.1558

Control Samples:

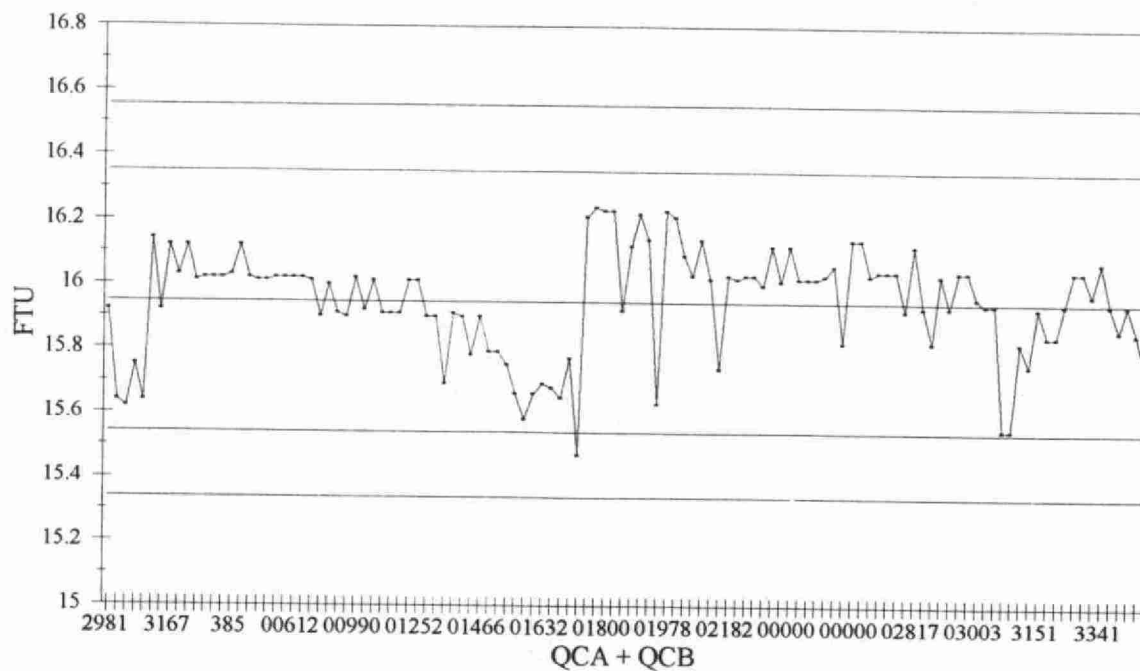
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	118	14.6254	14.6254	0.0000	0.1586
QCB:	118	1.3206	1.3206	0.0000	0.0229
QCA+QCB:	118	15.946	15.946	0.0000	0.1646
QCA-QCB:	118	13.3048	13.3048	0.0000	0.1558

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
134	0 - 2	0.7669	0.0207
33	2 - 5	3.1733	0.2539
26	5 - 10	7.5923	0.2227

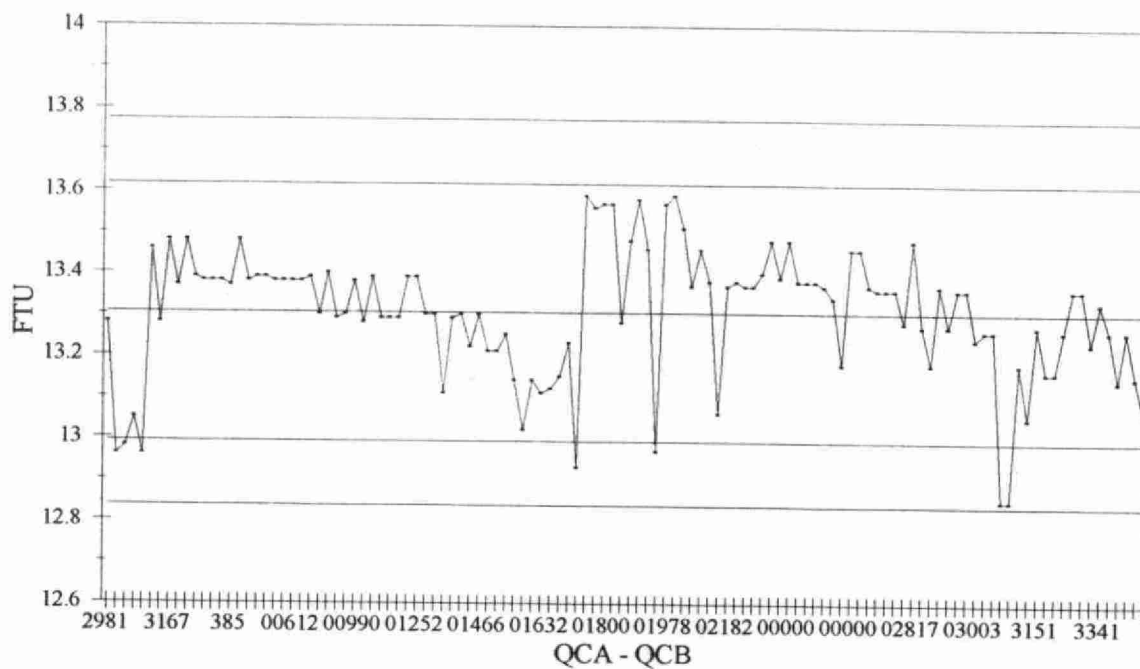
Turbidity

Quality Control Data: 950101 to 951231



Turbidity

Quality Control Data: 950101 to 951231



5.0 Metals Performance Summaries

BORON

IDENTIFICATION:

Method Title: The Determination of Boron in Water by Inductively Coupled Plasma - Atomic Emission Spectrophotometry (ICP-AES).

Method Number: E6036A

Method Introduced: June, 1988

Current Revision: January 27, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	Boron	5 µg/L	25 µg/L

SAMPLE MATRICES:

Sample matrices analyzed are domestic water, surface water, groundwater, industrial wastes, landfill test wells and sewage.

ANALYTICAL PROCEDURE:

Sample is aspirated without pretreatment into the analytical instrument. Concentration is determined by intensity of light emission at a specific boron wavelength of 249.6 nm.

CONTROLS AND QUALITY ASSURANCE:

Controls: Blank
ICAP7 (1.0 µg/L)

Drift: QCBOR (0.5 µg/L) analyzed every 10 samples

Duplicates: 1 for every 10 samples

Ref.Material: ICAP7 (EPA)

Interlabs: Ontario Ministry of the Environment and Energy Performance Evaluation Study
Great Lakes Action Program (GLAP)

Reporting: Maximum Significant Figures: 2
Units: µg/L (ppb)

Boron

Quality Control Data from 940101 to 941231

Analytical Range: 5 - 10,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0184

Control Samples:

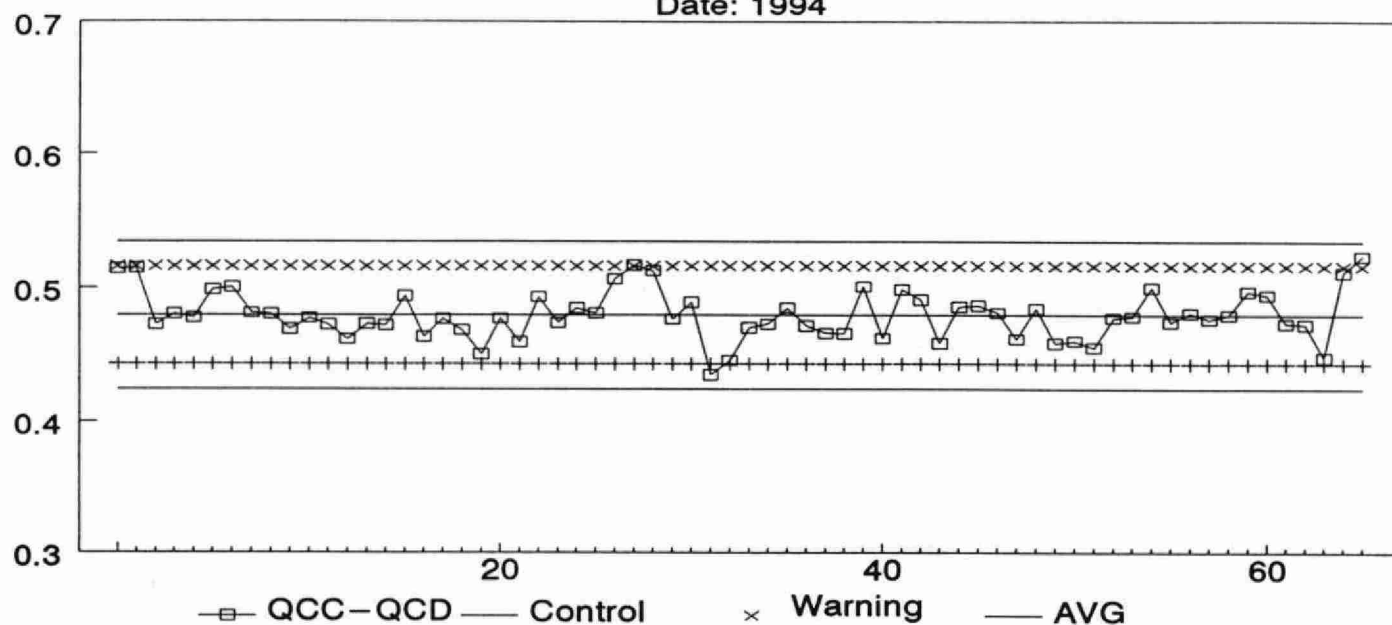
	Number of Data Points	Target Conc. (ug/mL)	Avg. Conc. Measured (ug/mL)	Average Bias (ug/mL)	Standard Deviation (ug/mL)
QCC:	66	1.000	0.9753	-0.0247	0.0181
QCD:	66	0.500	0.4956	-0.0044	0.0087
QCC+QCD:	66	1.500	1.4709	-0.0291	0.0216
QCC-QCD:	66	0.500	0.4797	-0.0203	0.0184

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
53	5 - 500	41.27	2.03
n/a	500 - 5000	n/a	n/a
n/a	5000 - 50000	n/a	n/a

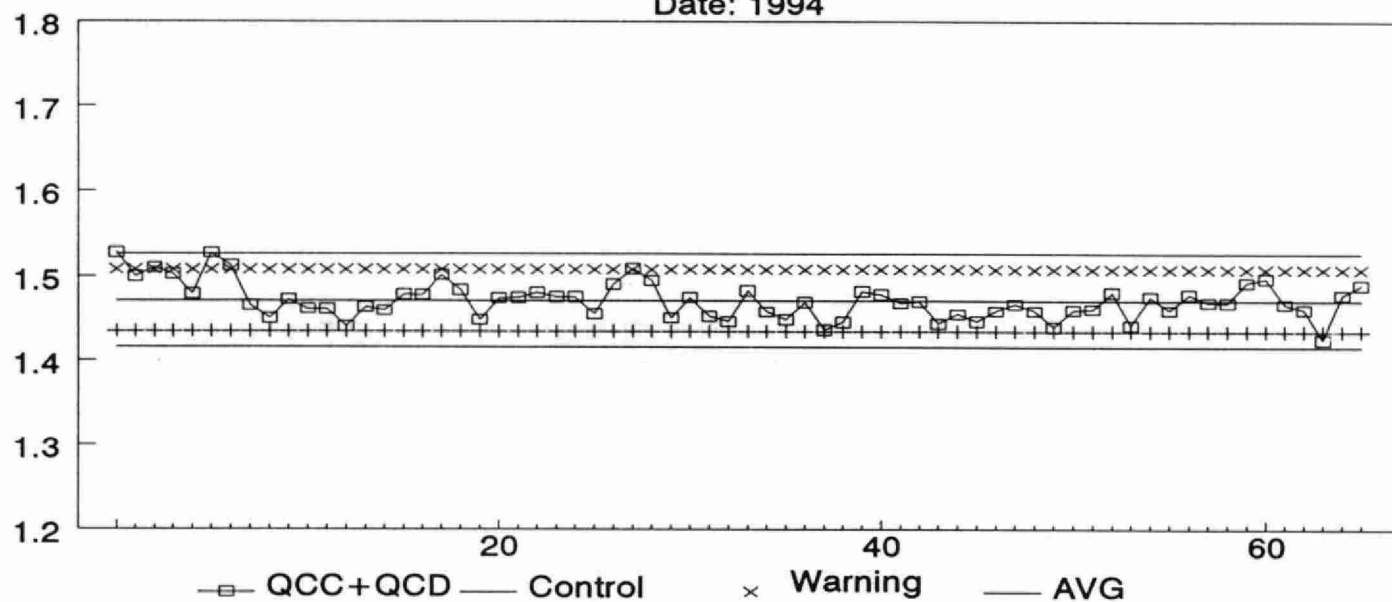
QC Difference Plot – Boron

Date: 1994



QC Sum Plot – Boron

Date: 1994



Boron

Quality Control Data from 950101 to 951231

Analytical Range: 5 - 10,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0114

Control Samples:

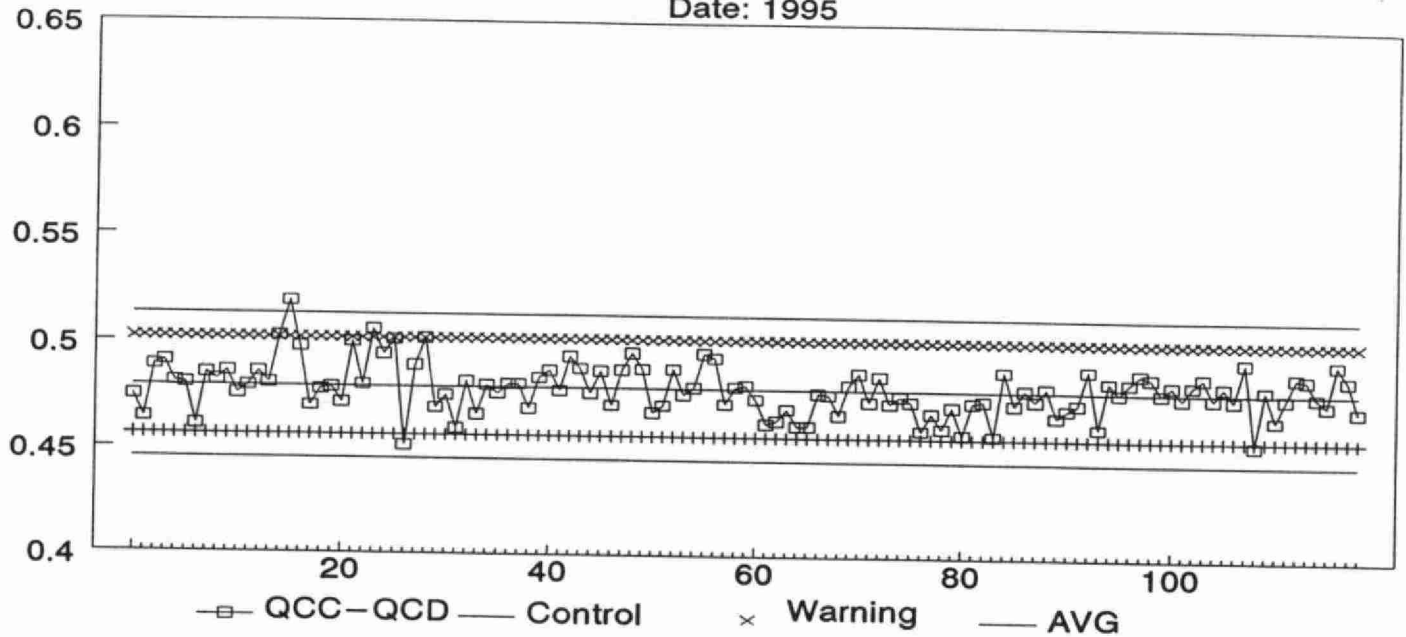
	Number of Data Points	Target Conc. (ug/mL)	Avg. Conc. Measured (ug/mL)	Average Bias (ug/mL)	Standard Deviation (ug/mL)
QCC:	119	1.000	0.9806	-0.0194	0.0153
QCD:	119	0.500	0.5014	0.0014	0.0079
QCC+QCD:	119	1.500	1.4819	-0.0181	0.0215
QCC-QCD:	119	0.500	0.4792	-0.0208	0.0114

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
83	5 - 500	50.35	2.61
7	500 - 5000	1350	8.94
n/a	5000 - 50000	n/a	n/a

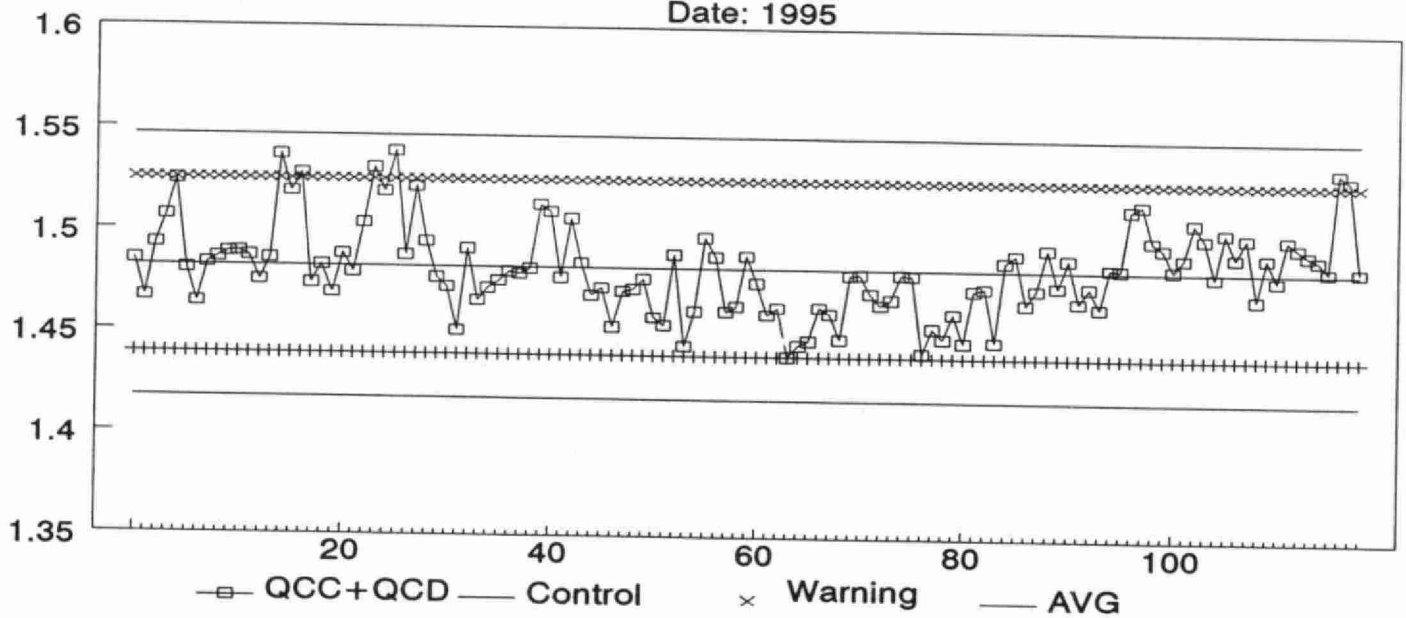
QC Difference Plot – Boron

Date: 1995



QC Sum Plot – Boron

Date: 1995



HYDRIDES: ANTIMONY, ARSENIC AND SELENIUM

IDENTIFICATION:

Method Title: The Determination of Arsenic, Selenium and Antimony in Surface and Drinking Water by Hydride Generation - Flameless Atomic Adsorption Spectrophotometry (HYD-FAAS).

Method Number: E6038A
Method Introduced: 1980
Current Revision: March 31, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	Arsenic	.2 µg/L	1.0 µg/L
	Selenium	.2 µg/L	1.0 µg/L
	Antimony	.2 µg/L	1.0 µg/L

SAMPLE MATRICES:

Sample matrices analyzed are surface water, drinking water, industrial effluent and landfill leachate.

ANALYTICAL PROCEDURE:

Samples are digested in oxidizing acid mixtures to oxidize all forms. It is reduced by sodium borohydride and swept into a heated quartz tube by argon carrier gas. Concentration is determined by flameless atomic absorption spectrometry.

CONTROLS AND QUALITY ASSURANCE:

Controls: Blank
Quality Control Solutions A, B and C

Drift: Sensitivity Checks after every 10 samples

Duplicates: 1 for every 13 samples

Ref.Material: ERA PP/CLP Trace Metals Standard

Interlabs: Ontario Ministry of the Environment and Energy Performance Evaluation Study
GLAP participant

Reporting: Maximum Significant Figures: 2
Units: µg/L (ppb)

Arsenic

Quality Control Data from 940101 to 941231

Analytical Range: 0.2 - 40 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(A-B): 0.4540

Control Samples:

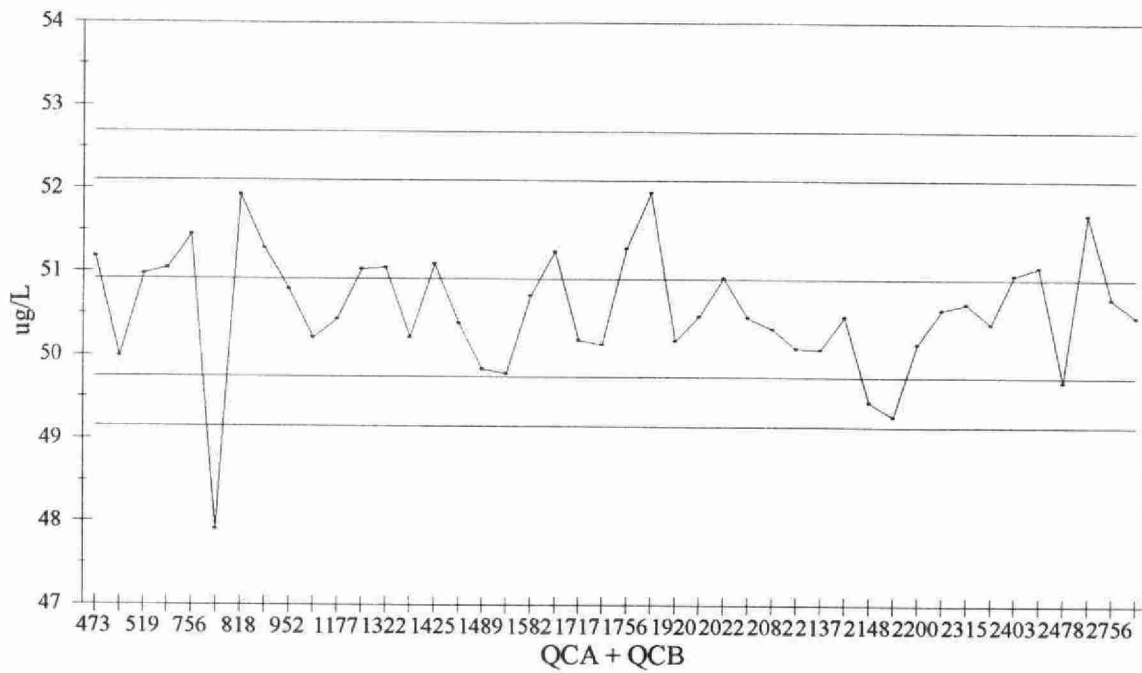
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	44	40	39.8745	-0.1255	0.5722
QCB:	44	10	10.6714	0.6714	0.4129
QCA+QCB:	44	50	50.5458	0.5458	0.7372
QCA-QCB:	44	30	29.2031	-0.7969	0.6725

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
141	0 - 8.0	1.1364	0.1861
14	8.0 - 20.0	12.9143	1.3287
5	20.0 - 40.0	23.1600	1.8971

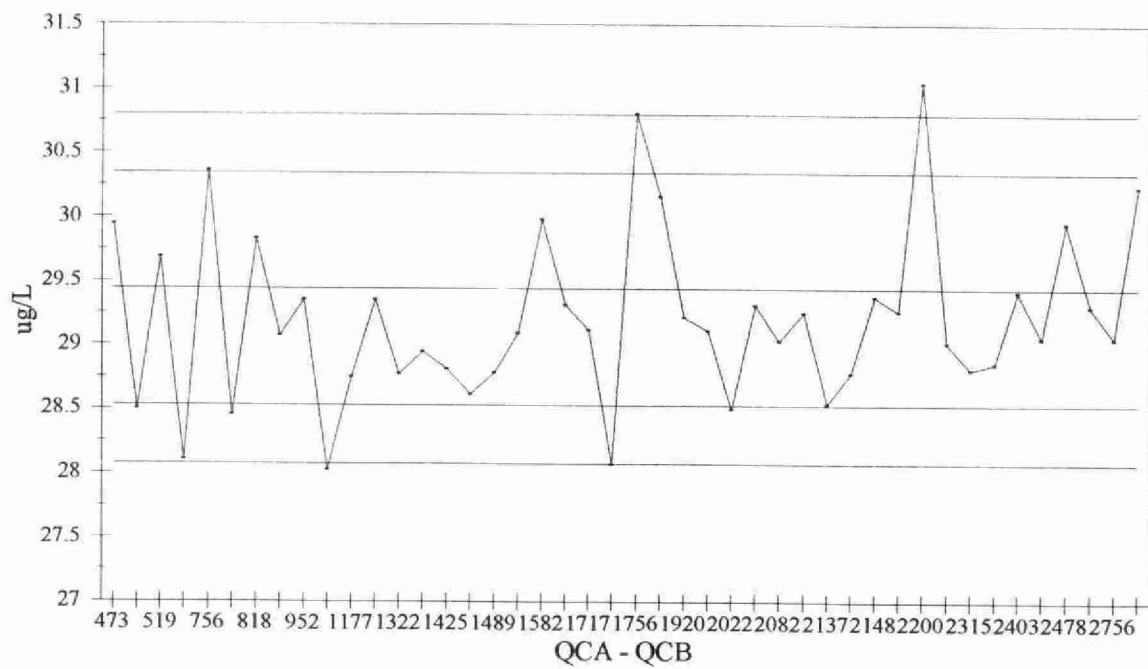
Arsenic

Quality Control Data: 940101 to 941231



Arsenic

Quality Control Data: 940101 to 941231



Arsenic

Quality Control Data from 950101 to 951231

Analytical Range: 0.2 - 40 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(A-B): 0.6725

Control Samples:

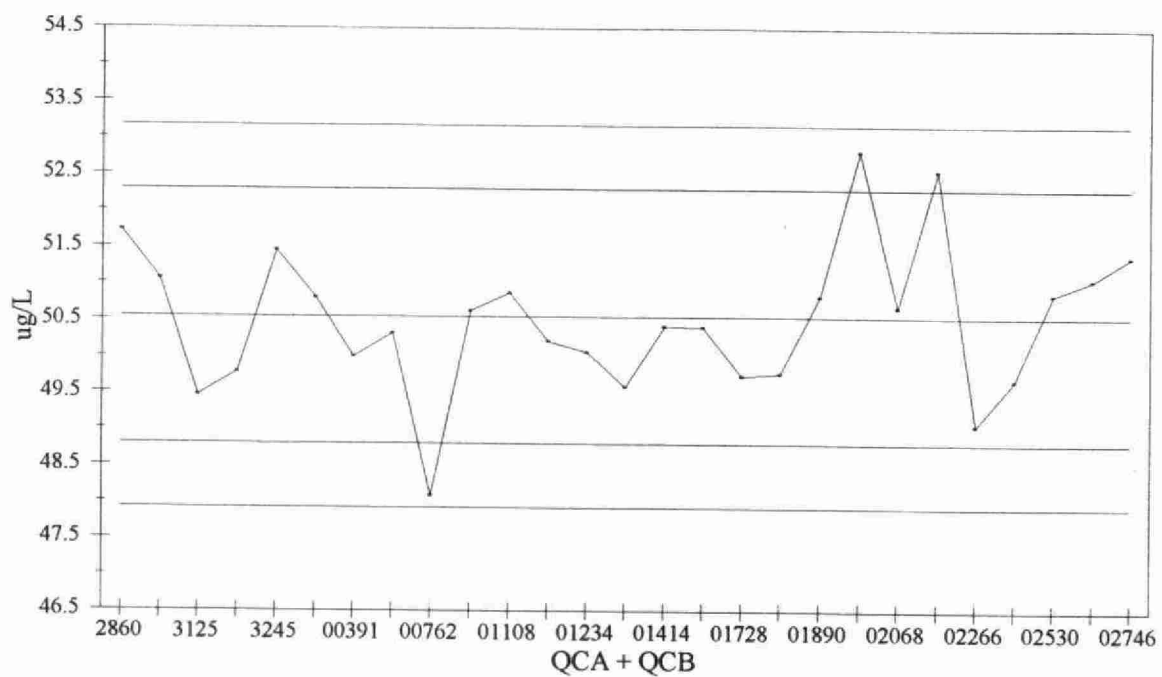
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	27	40	39.9476	-0.0524	0.7593
QCB:	27	10	10.5412	0.5412	0.4900
QCA+QCB:	27	50	50.4887	0.4887	1.0131
QCA-QCB:	27	30	29.4064	-0.5936	0.7790

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
82	0 - 8.0	0.8983	0.1433
9	8.0 - 20.0	16.1889	0.7118
0	20.0 - 40.0	n/a	n/a

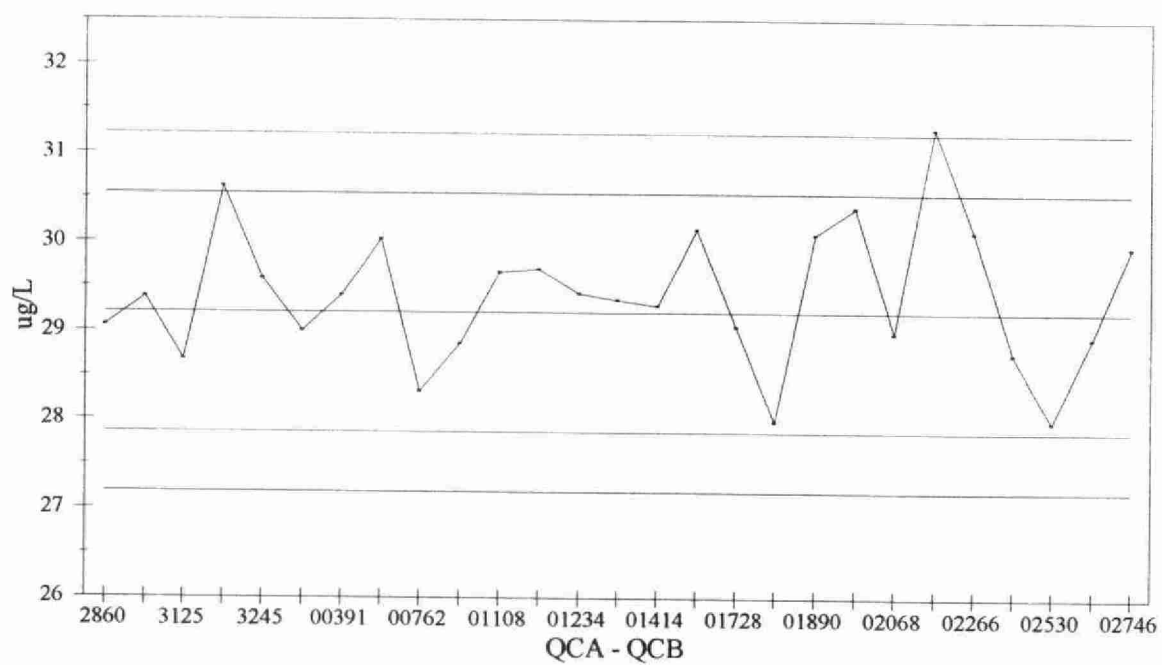
Arsenic

Quality Control Data: 950101 to 951231



Arsenic

Quality Control Data: 950101 to 951231



Selenium

Quality Control Data from 940101 to 941231

Analytical Range: 0.2 - 40 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(A-B): 0.5761

Control Samples:

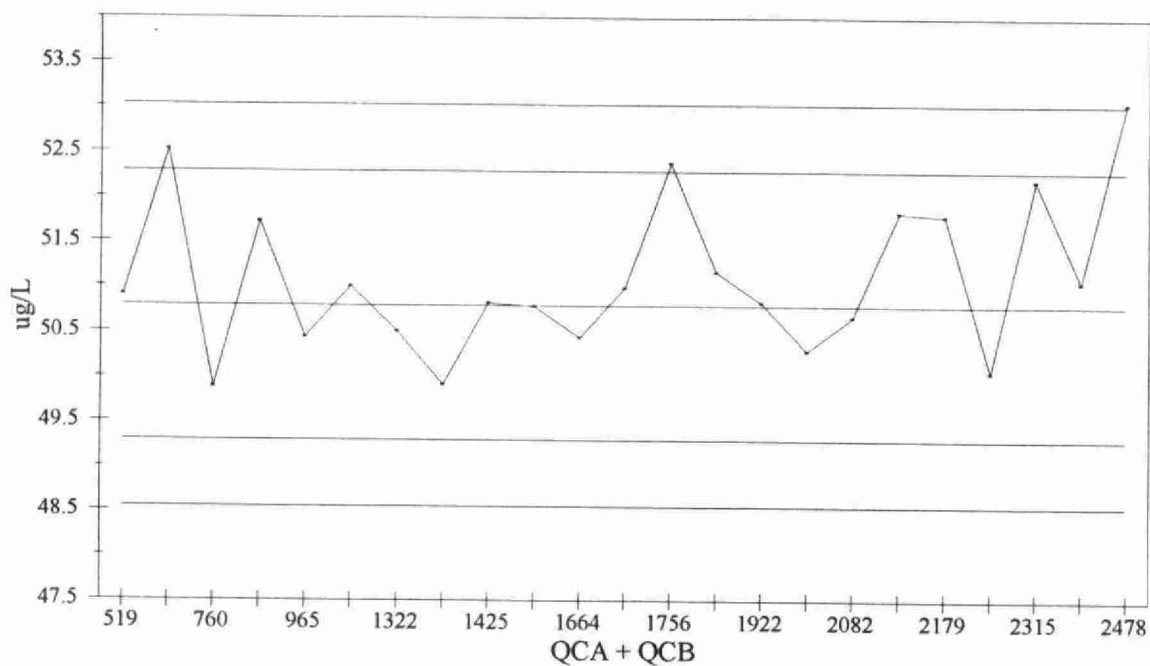
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	23	40	40.1750	0.1750	0.6996
QCB:	23	10	10.9202	0.9202	0.4118
QCA+QCB:	23	50	51.0952	1.0952	0.8661
QCA-QCB:	23	30	29.2548	-0.7452	0.7536

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
53	0 - 8.0	0.5513	0.0650
4	8.0 - 20.0	13.5625	0.0535
0	20.0 - 40.0	n/a	n/a

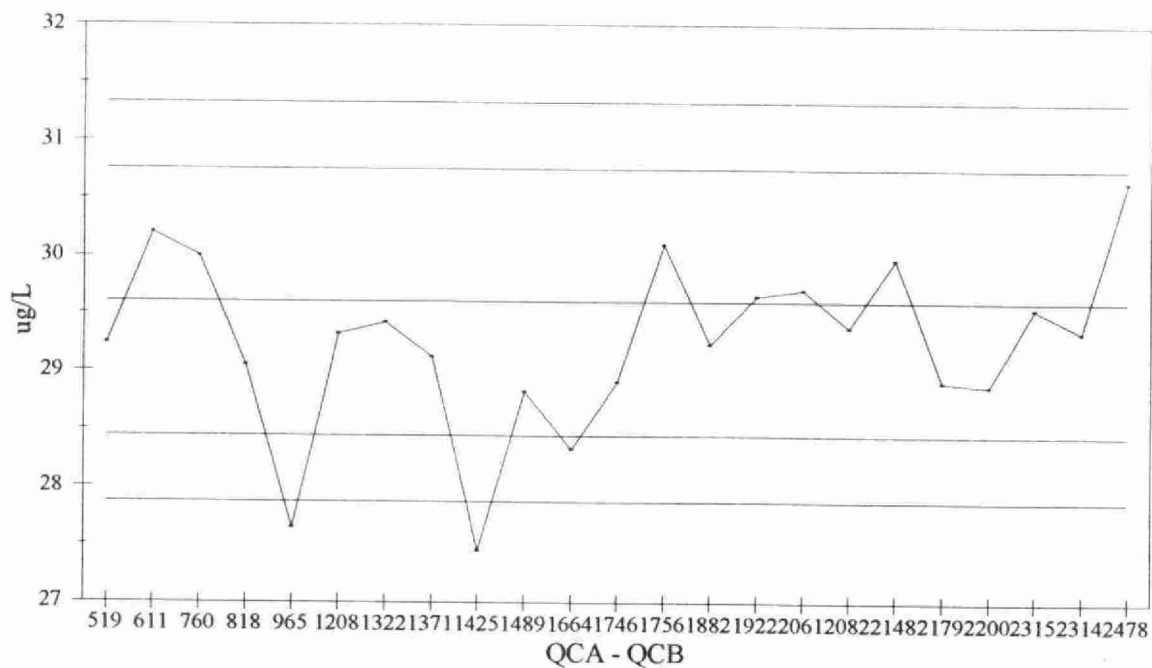
Selenium

Quality Control Data: 940101 to 941231



Selenium

Quality Control Data: 940101 to 941231



Selenium

Quality Control Data from 950101 to 951231

Analytical Range: 0.2 - 40 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(A-B): 0.7536

Control Samples:

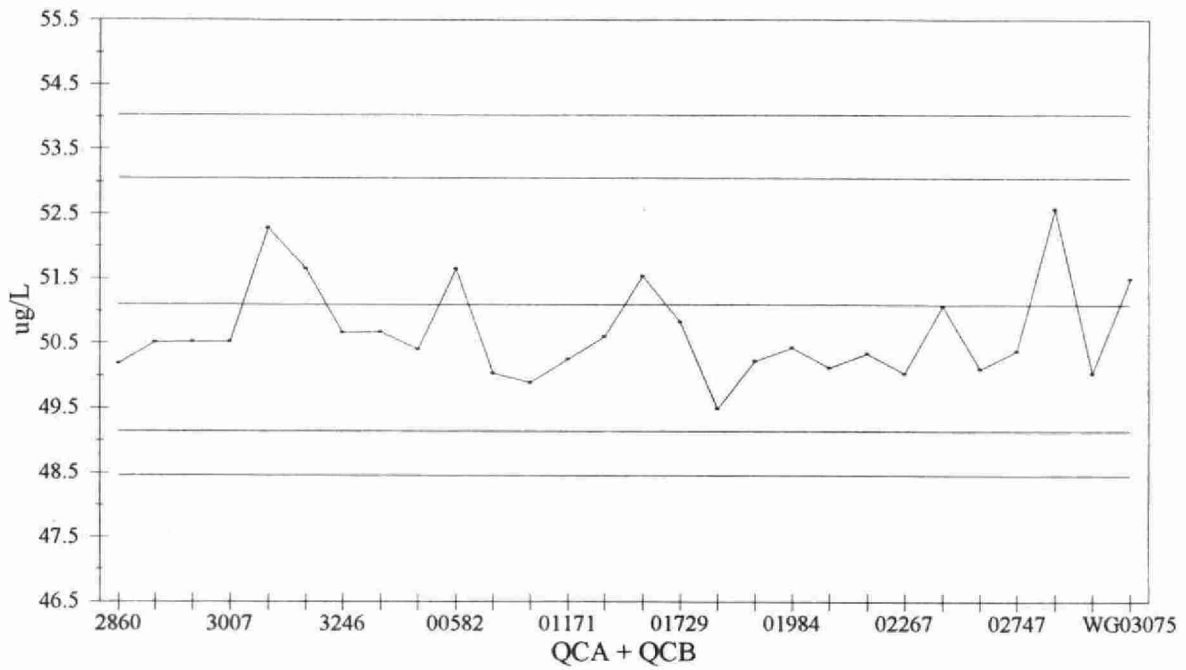
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	28	40	40.1812	0.1812	0.6177
QCB:	28	10	10.4804	0.4804	0.3751
QCA+QCB:	28	50	50.6616	0.6516	0.7354
QCA-QCB:	28	30	29.7008	-0.2993	0.7097

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
71	0 - 8.0	0.2301	0.0384
4	8.0 - 20.0	18.0000	1.2247
4	20.0 - 40.0	30.8000	0.6364

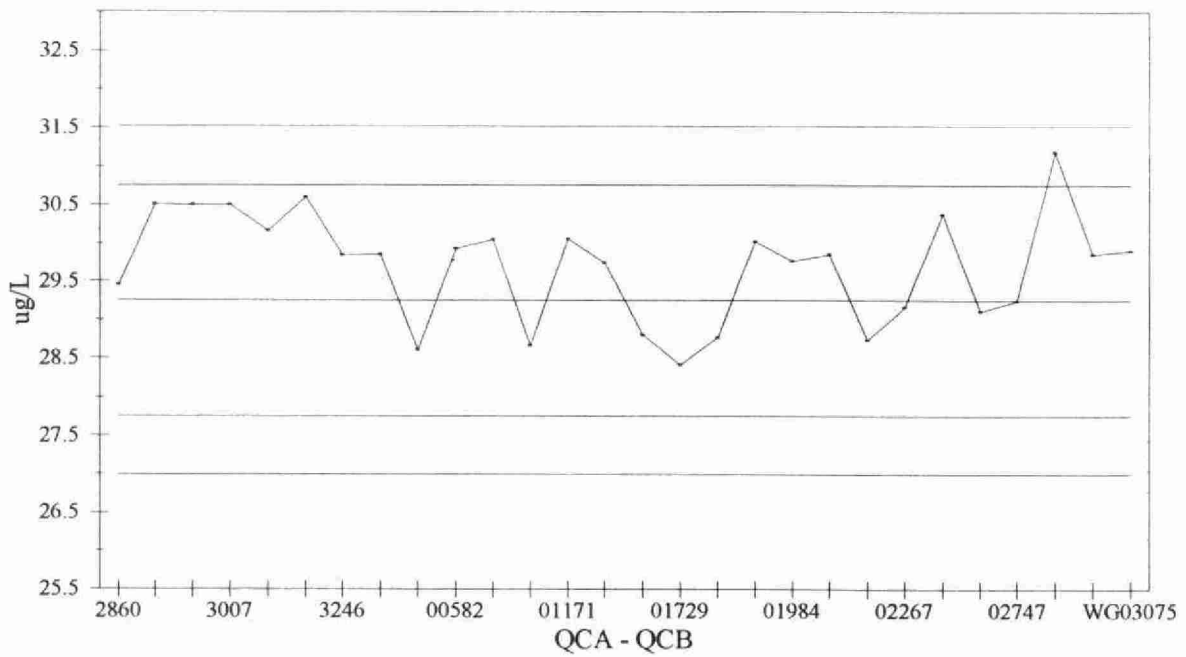
Selenium

Quality Control Data: 950101 to 951231



Selenium

Quality Control Data: 950101 to 951231



Antimony

Quality Control Data from 940101 to 941231

Analytical Range: 0.2 - 40 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(A-B): 0.5761

Control Samples:

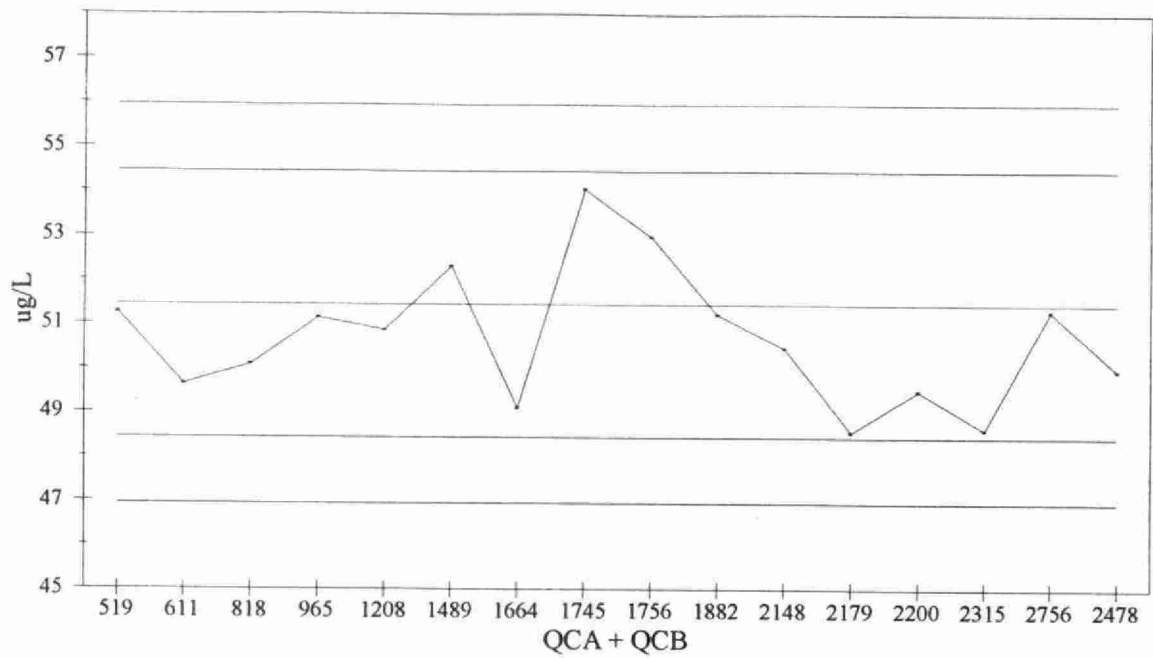
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	16	40	40.6456	0.6456	0.8746
QCB:	16	10	10.0414	0.0414	1.1884
QCA+QCB:	16	50	50.6869	0.6869	1.5338
QCA-QCB:	16	30	30.6042	0.6042	1.4149

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
21	0 - 8.0	0.6619	0.0797
0	8.0 - 20.0	n/a	n/a
0	20.0 - 40.0	n/a	n/a

Antimony

Quality Control Data: 940101 to 941231



Antimony

Quality Control Data: 940101 to 941231



Antimony

Quality Control Data from 950101 to 951231

Analytical Range: 0.2 - 40 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(A-B): 1.4149

Control Samples:

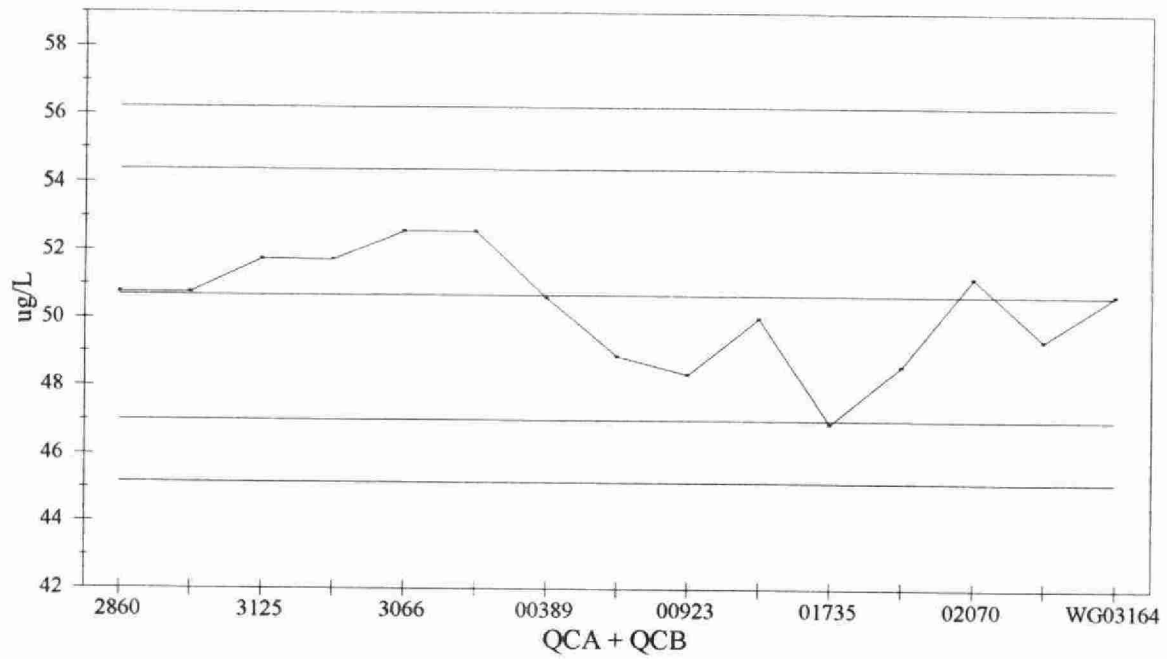
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	15	40	40.2771	0.2771	1.3739
QCB:	15	10	10.0425	0.0425	0.3934
QCA+QCB:	15	50	50.3196	0.3196	1.6236
QCA-QCB:	15	30	30.2347	0.2347	1.2036

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
24	0 - 8.0	0.8667	0.1249
0	8.0 - 20.0	n/a	n/a
0	20.0 - 40.0	n/a	n/a

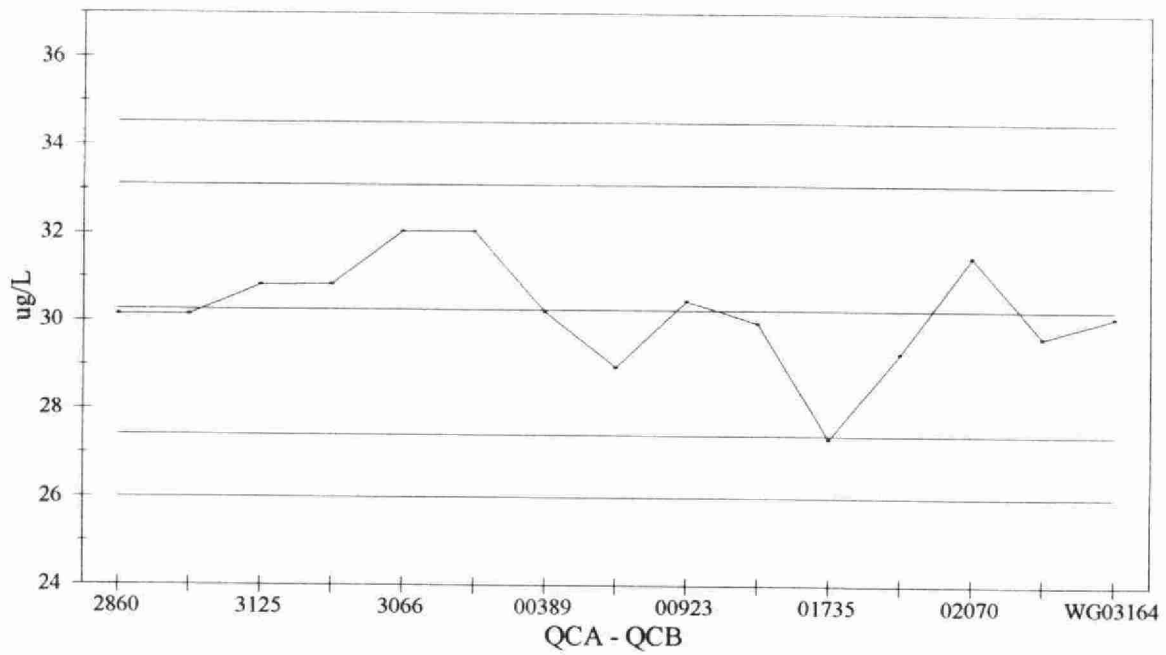
Antimony

Quality Control Data: 950101 to 951231



Antimony

Quality Control Data: 950101 to 951231



MAJOR CATIONS

IDENTIFICATION:

Method Title: The Determination of Cations (Sodium, Potassium, Calcium and Magnesium) and Hardness in Aqueous Samples by Sequential Inductively Coupled Plasma - Atomic Emission Spectrophotometry (ICP-AES).

Method Number: E6047A

Method Introduced: November, 1991

Current Revision: April 04, 1995

PARAMETER:	Parameter Name	W(units)	T(units)
	Sodium	0.05 mg/L	0.25 mg/L
	Potassium (ICP)	0.5 mg/L	2.5 mg/L
	Potassium (AA)	0.02 mg/L	0.10 mg/L
	Calcium	0.05 mg/L	0.25 mg/L
	Magnesium	0.25 mg/L	1.25 mg/L

SAMPLE MATRICES:

Sample matrices analyzed are sewage, surface water, landfill, drinking water, leachates and industrial wastes.

ANALYTICAL PROCEDURE:

Concentrations in solution are determined by inductively coupled argon plasma emission spectroscopy (direct aspiration. Samples containing less than 1 ppm potassium are analyzed by atomic absorption spectroscopy, which has a lower detection limit for potassium.

CONTROLS AND QUALITY ASSURANCE:

Controls: Blank
Quality Control Solution D
Quality Control Solution C (Veg 7)

Drift: Veg 7 analyzed every 10 samples

Duplicates: 1 for every 20 samples

Ref.Material: SLRS-2 (National Research Council, Canada)
EPA PP/CLP Cations Standard

Interlabs: CAEAL Certified
Ontario Ministry of the Environment and Energy Performance Evaluation Study
LRTAP and GLAP Participant

Reporting: Maximum Significant Figures: 2
Units: mg/L (ppm)

Calcium (Reactive)

Quality Control Data from 940101 to 941231

Analytical Range: 0.05 - 500 mg/L

Detection Limit (W): 0.05 mg/L

Sw used to calculate control limits -

Sw(C-D): 0.5550

Control Samples:

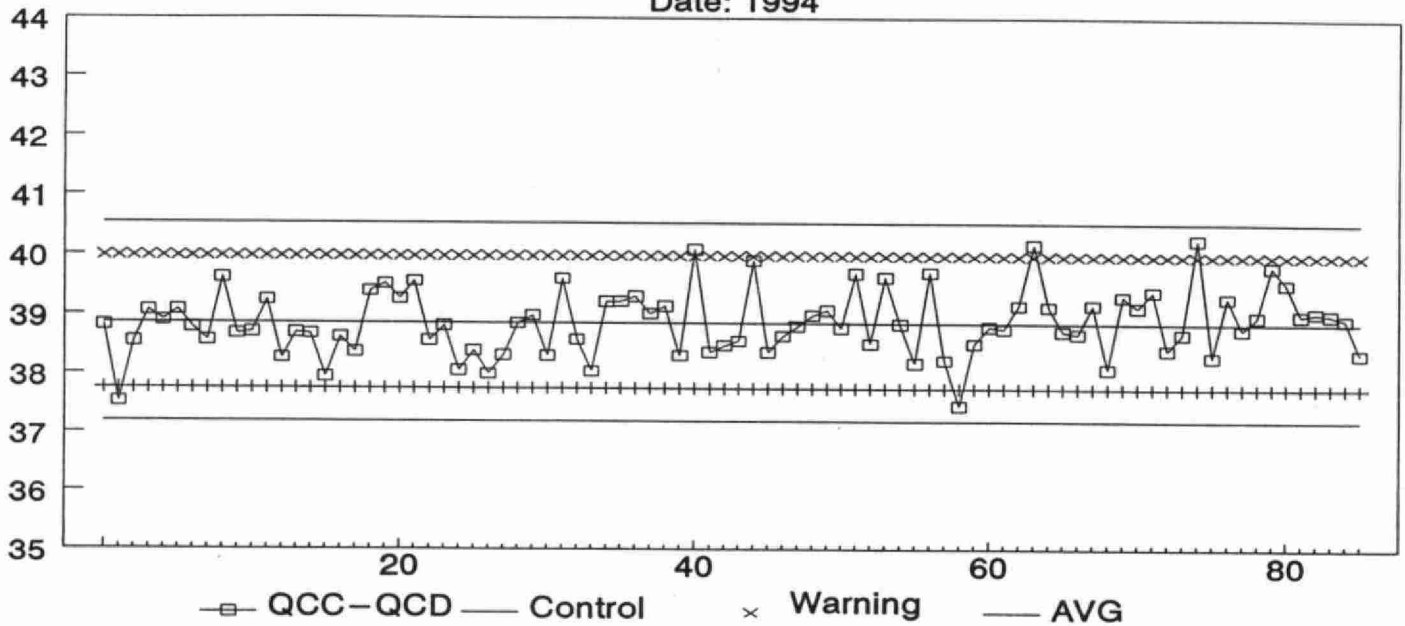
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	86	40.000	39.8667	-0.1333	0.5637
QCD:	86	1.000	1.0036	0.0036	0.0170
QCC+QCD:	86	41.000	40.8703	-0.1297	0.5727
QCC-QCD:	86	39.000	38.8631	-0.1369	0.5550

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
18	0.05 - 5	2.04	0.058
67	5 - 50	18.0	0.24
30	50 - 500	116	1.5

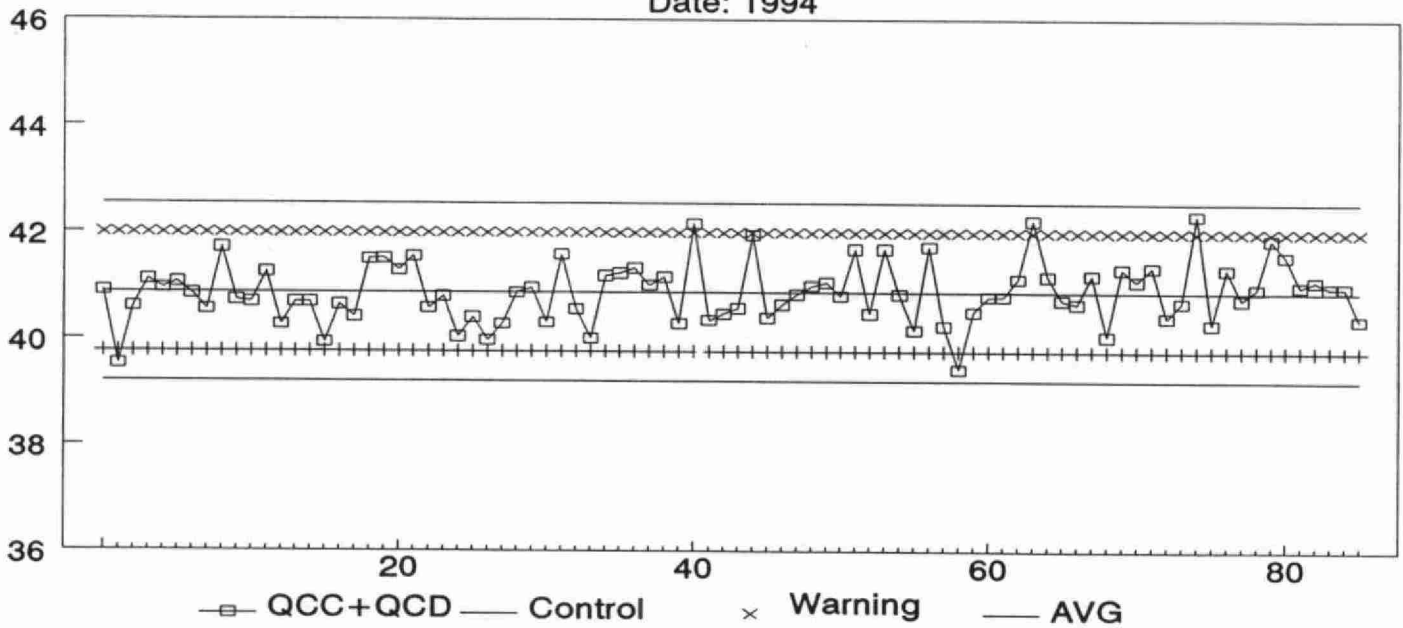
QC Difference Plot – Calcium

Date: 1994



QC Sum Plot – Calcium

Date: 1994



Calcium (Reactive)

Quality Control Data from 950101 to 951231

Analytical Range: 0.05 - 500 mg/L

Detection Limit (W): 0.05 mg/L

Sw used to calculate control limits -

Sw(C-D): 0.4786

Control Samples:

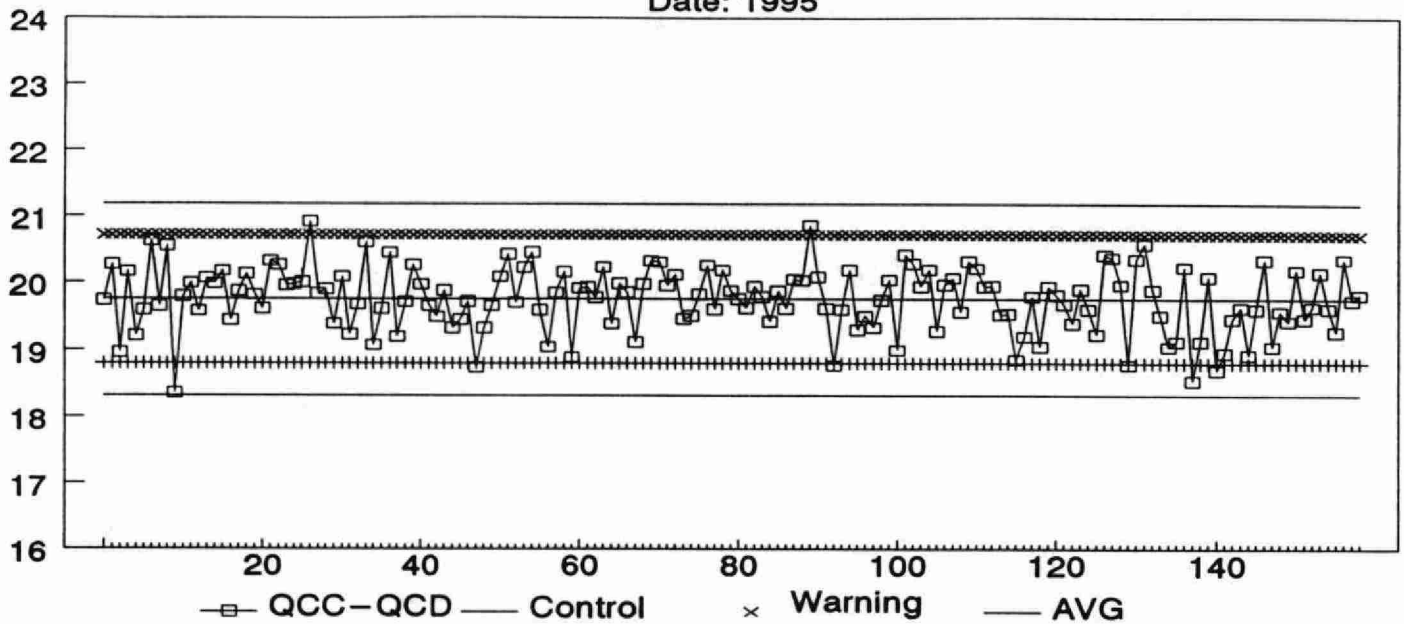
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	159	40.000	39.9159	-0.0841	0.7106
QCD:	159	20.000	20.1690	0.1690	0.7797
QCC+QCD:	159	60.000	60.0645	0.0645	1.3865
QCC-QCD:	159	20.000	19.7532	-0.2468	0.4786

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
26	0.05 - 5	1.94	0.078
101	5 - 50	17.6	0.33
50	50 - 500	112	1.48

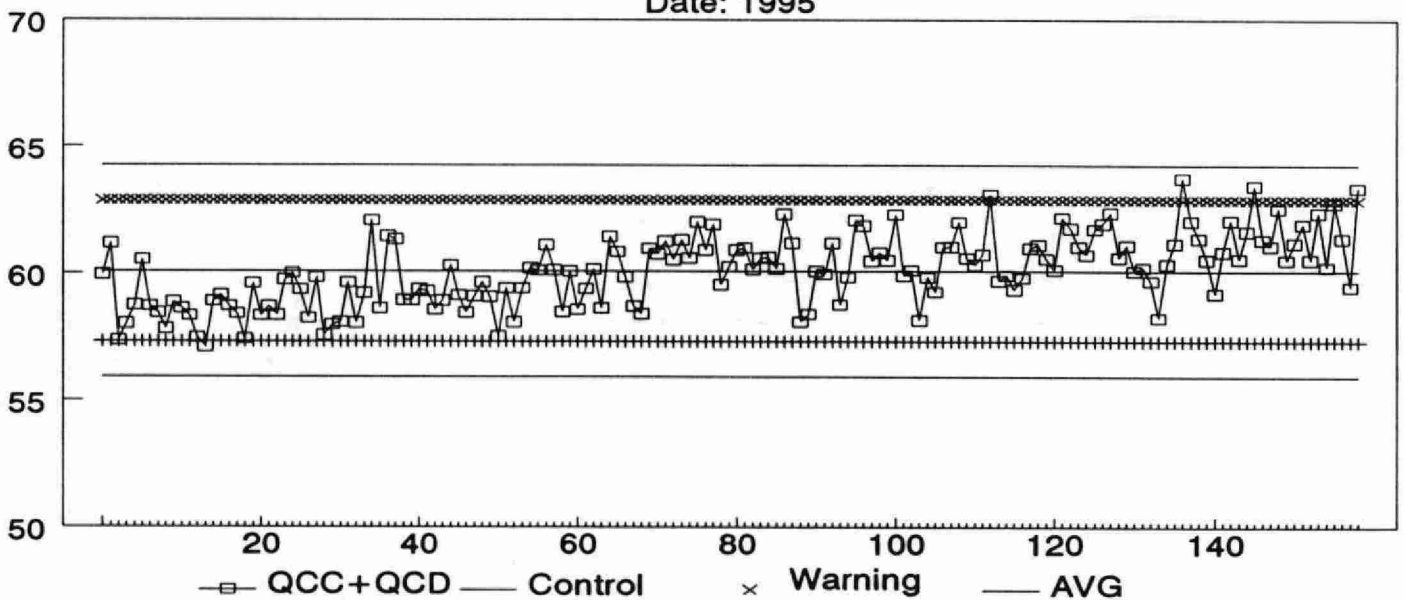
QC Difference Plot - Ca

Date: 1995



QC Sum Plot - Ca

Date: 1995



Magnesium (Reactive)

Quality Control Data from 940101 to 941231

Analytical Range: 0.02 - 200 mg/L

Detection Limit (W): 0.02 mg/L

Sw used to calculate control limits -

Sw(C-D): 0.1450

Control Samples:

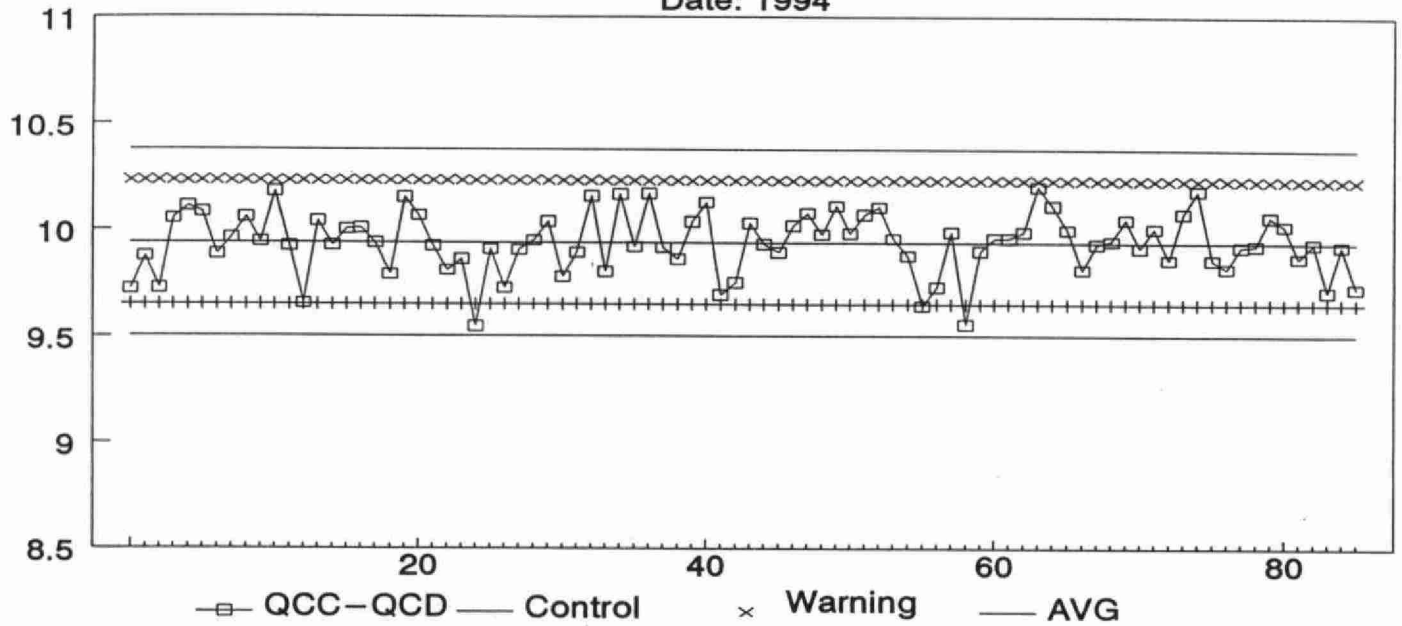
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	86	10.000	10.0419	0.0419	0.1460
QCD:	86	0.100	0.1024	0.0024	0.0023
QCC+QCD:	86	10.100	10.1443	0.0443	0.1471
QCC-QCD:	86	9.900	9.9394	0.0394	0.1450

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
65	0.02 - 5	2.22	0.033
50	5 - 50	19.7	0.44
4	50 - 500	79	1.4

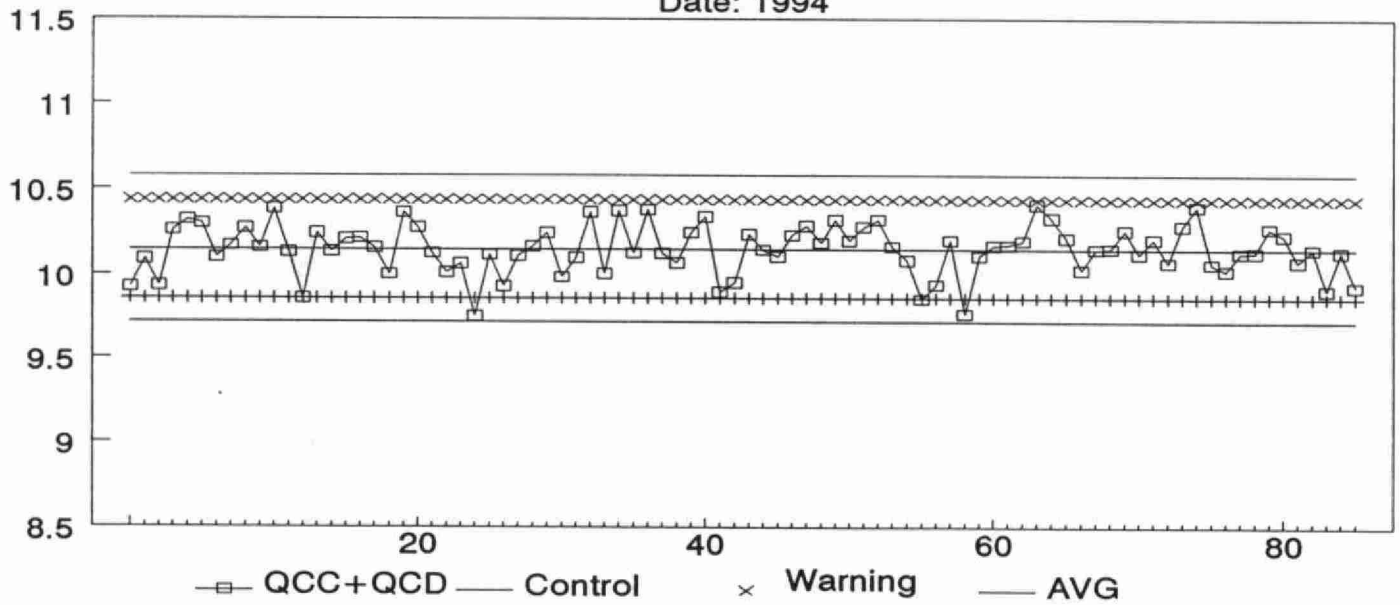
QC Difference Plot - Mg

Date: 1994



QC Sum Plot - Mg

Date: 1994



Magnesium (Reactive)

Quality Control Data from 950101 to 951231

Analytical Range: 0.02 - 200 mg/L

Detection Limit (W): 0.02 mg/L

Sw used to calculate control limits -

Sw(C-D): 0.1189

Control Samples:

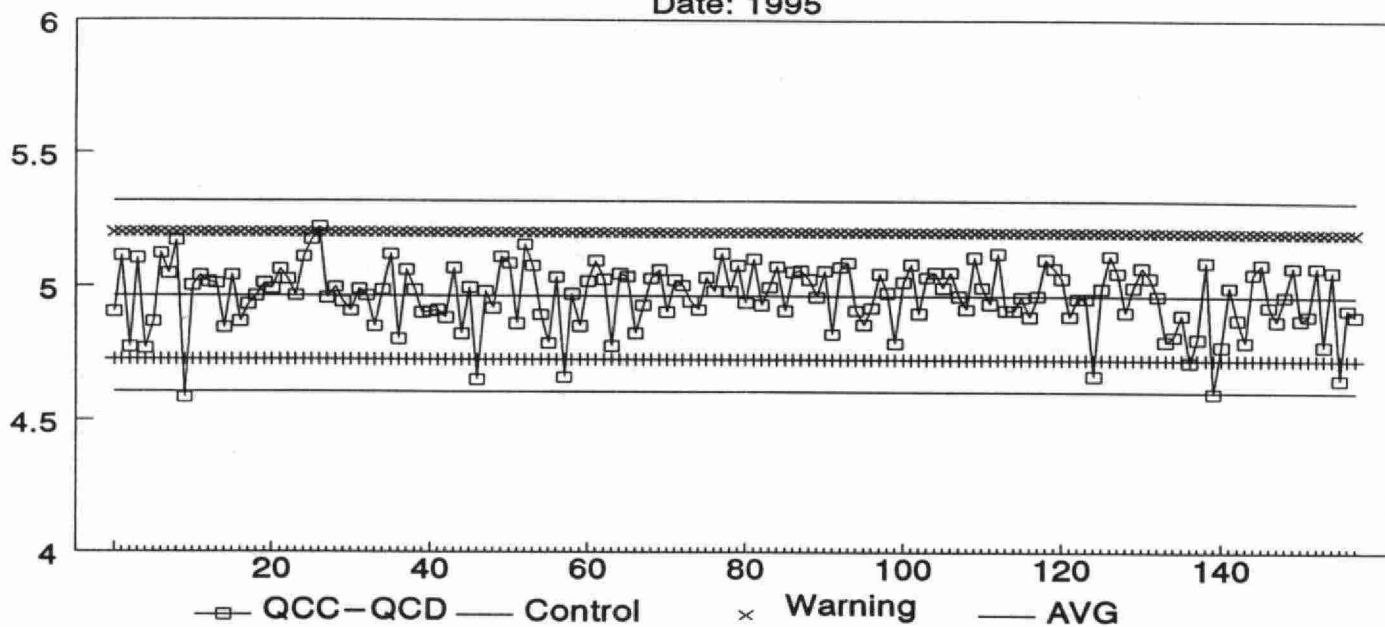
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	158	10.000	9.7665	-0.2335	0.1458
QCD:	158	5.000	4.8018	-0.1982	0.1684
QCC+QCD:	158	15.000	14.5655	-0.4345	0.2904
QCC-QCD:	158	5.000	4.9646	-0.0354	0.1189

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
90	0.02 - 5	2.04	0.040
70	5 - 50	15.0	0.24
12	50 - 500	99	1.2

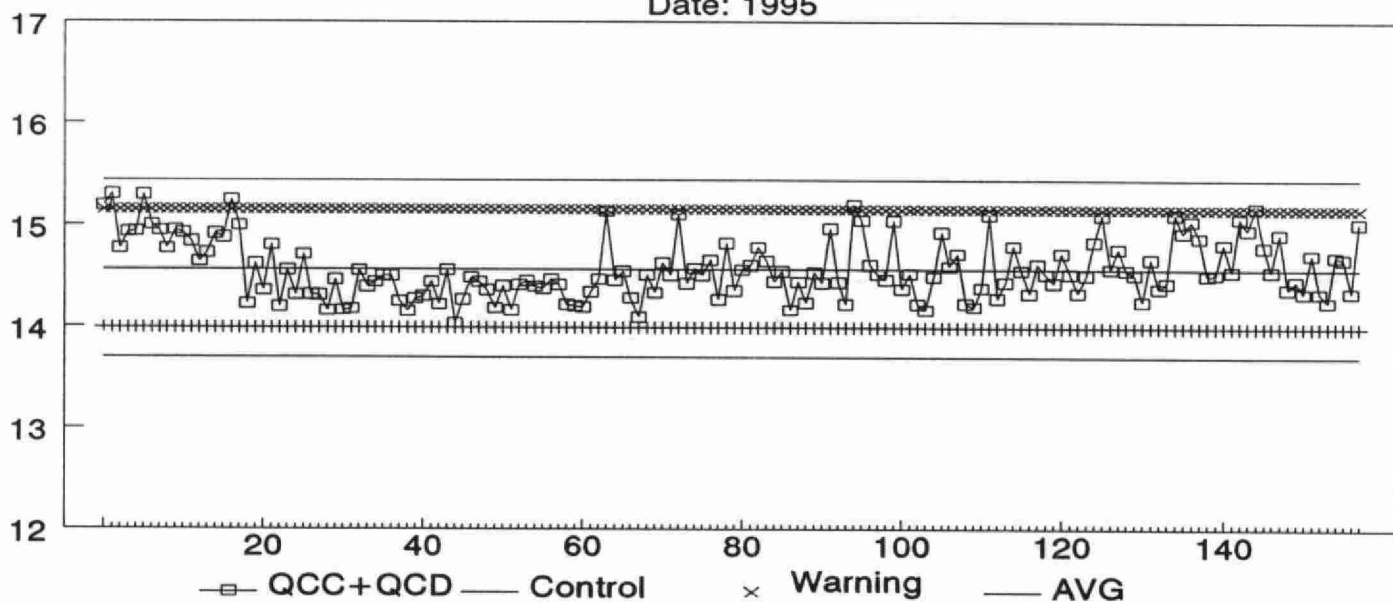
QC Difference Plot - Mg

Date: 1995



QC Sum Plot - Mg

Date: 1995



Potassium (Reactive)

Quality Control Data from 940101 to 941231

Analytical Range: 0.25 - 250 mg/L

Detection Limit (W): 0.25 mg/L

Sw used to calculate control limits -

Sw(C-D): 0.4252

Control Samples:

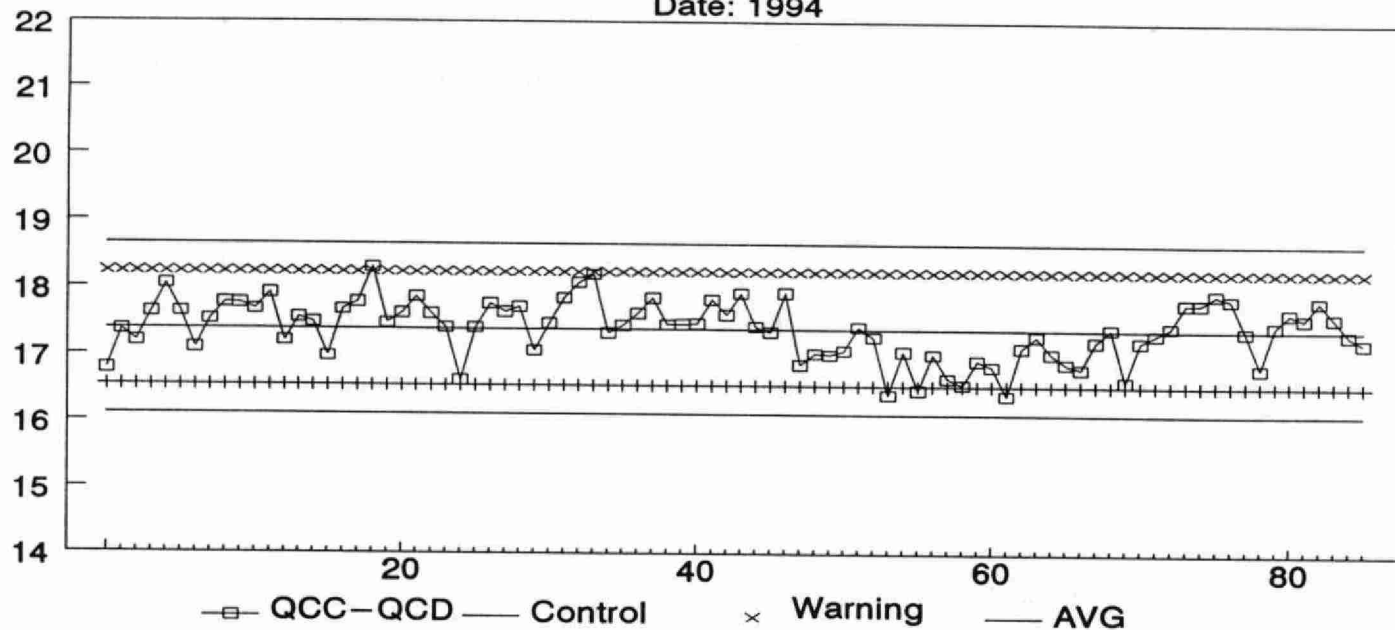
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	86	20.000	19.3962	-0.6038	0.4381
QCD:	86	2.000	2.0110	0.0110	0.0971
QCC+QCD:	86	22.000	21.4072	-0.5928	0.4711
QCC-QCD:	86	18.000	17.3851	-0.6149	0.4252

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
112	0.25 - 25	1.90	0.148
6	25 - 250	114	1.63
n/a	250 - 2500	n/a	n/a

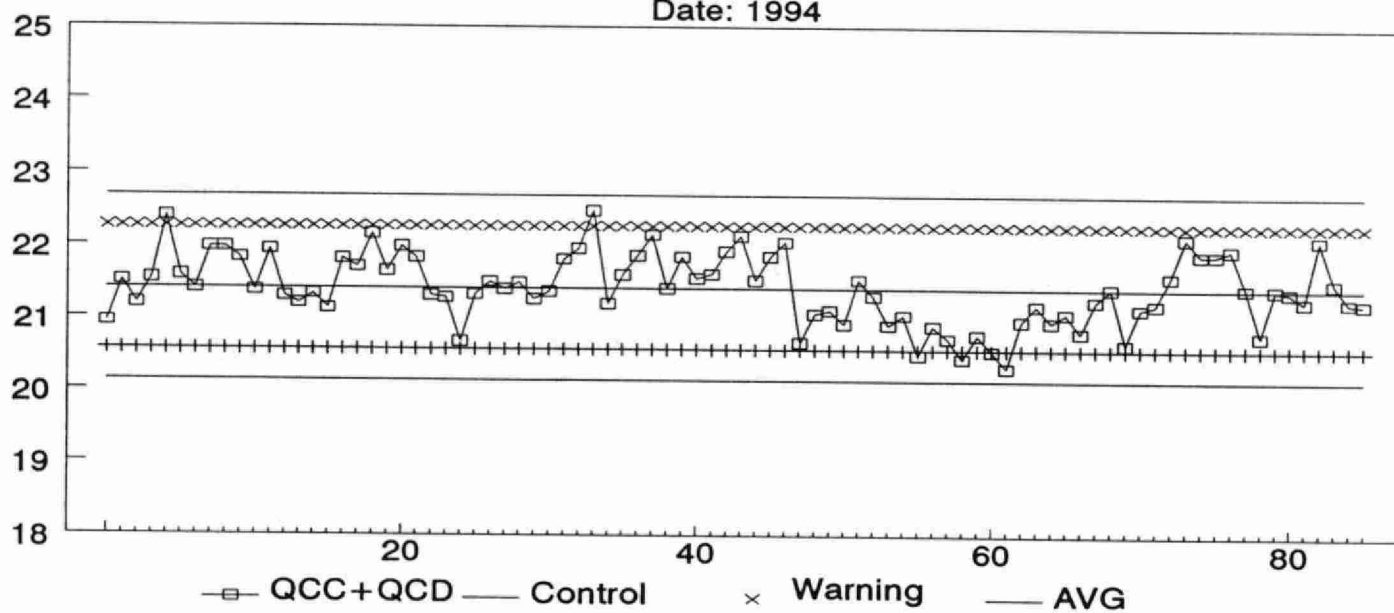
QC Difference Plot - K

Date: 1994



QC Sum Plot - K

Date: 1994



Potassium (Reactive)

Quality Control Data from 950101 to 951231

Analytical Range: 0.25 - 250 mg/L

Detection Limit (W): 0.25 mg/L

Sw used to calculate control limits -

Sw(C-D): 0.4299

Control Samples:

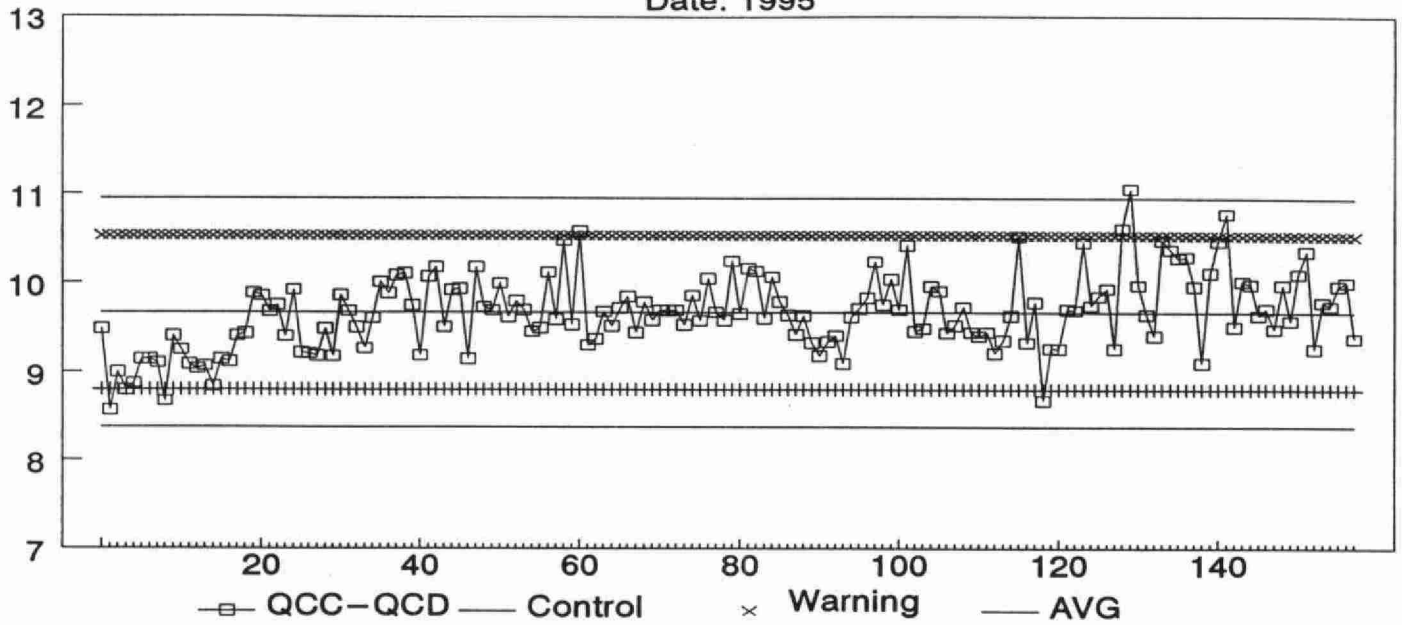
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	158	20.000	19.5058	-0.4942	0.4210
QCD:	158	10.000	9.8412	-0.1588	0.1781
QCC+QCD:	158	30.000	29.3470	-0.6530	0.4829
QCC-QCD:	158	10.000	9.6646	-0.3354	0.4299

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
173	0.25 - 25	2.31	0.306
6	25 - 250	57.4	0.72
n/a	250 - 2500	n/a	n/a

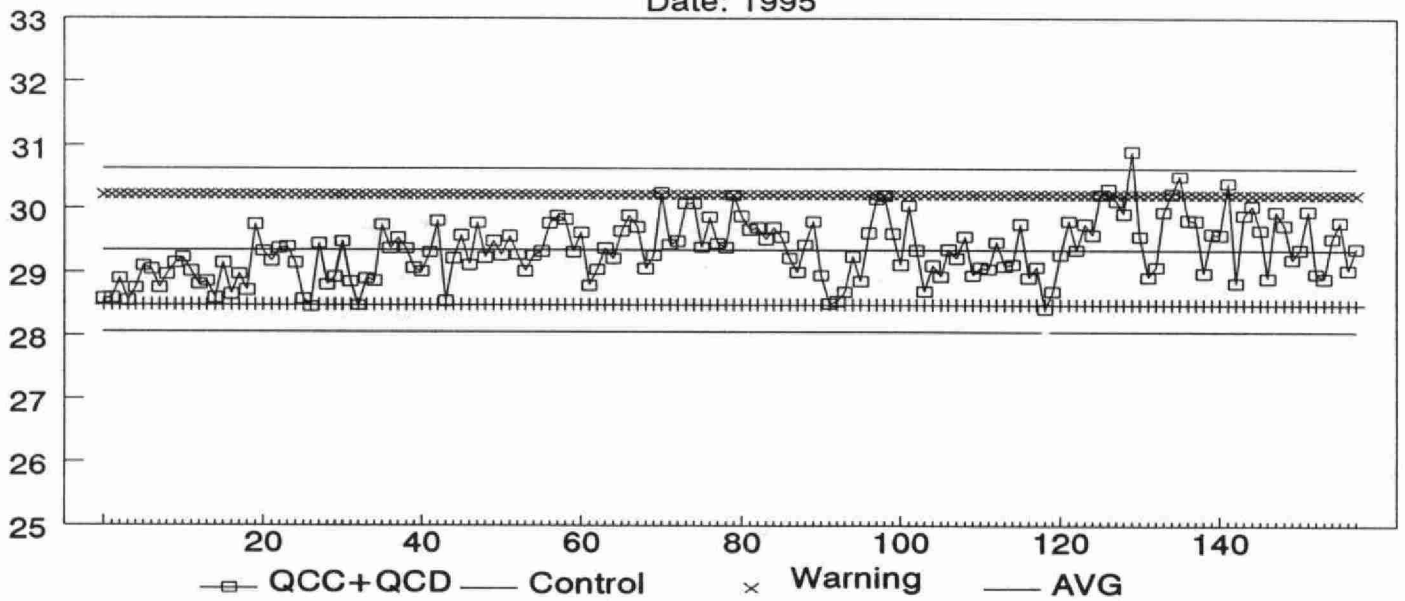
QC Difference Plot - K

Date: 1995



QC Sum Plot - K

Date: 1995



Sodium (Reactive)

Quality Control Data from 940101 to 941231

Analytical Range: 0.05 - 500 mg/L

Detection Limit (W): 0.05 mg/L

Sw used to calculate control limits -

Sw(C-D): 0.3701

Control Samples:

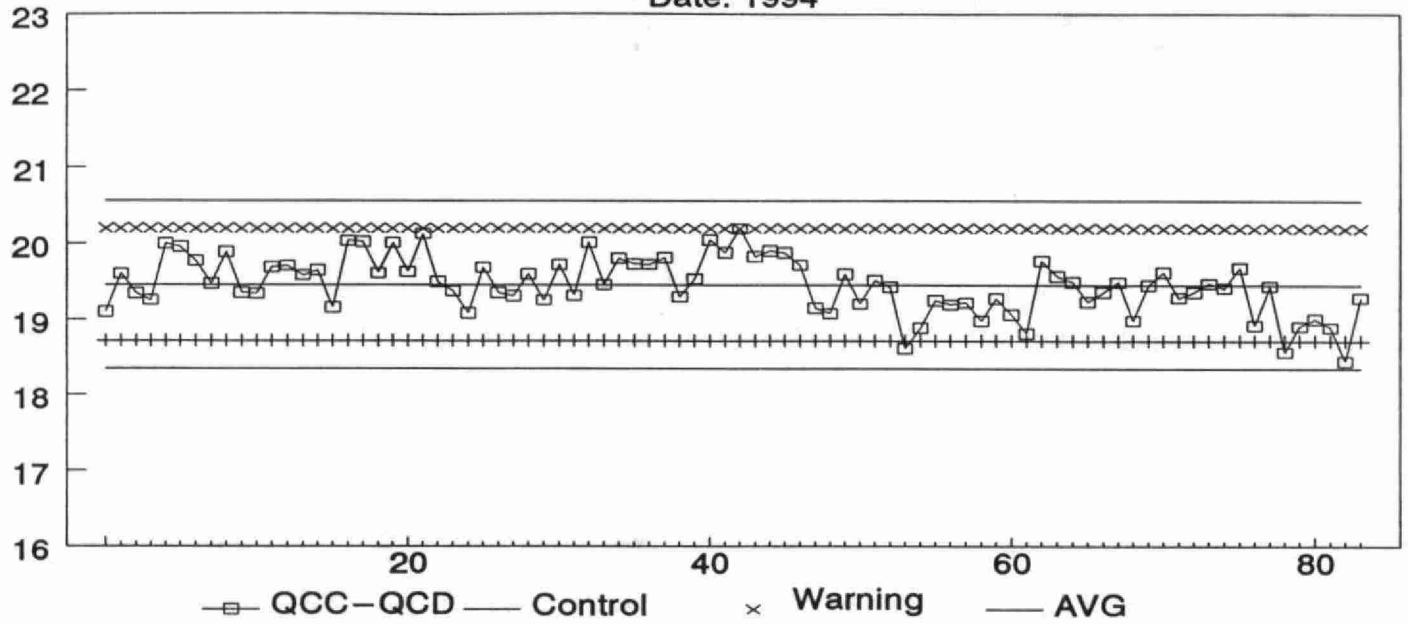
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	84	20.000	19.9649	-0.0351	0.3830
QCD:	84	0.500	0.5081	0.0081	0.0231
QCC+QCD:	84	20.500	20.4730	-0.0270	0.3967
QCC-QCD:	84	19.500	19.4567	-0.0433	0.3701

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
68	0.05 - 5	2.20	0.048
39	5 - 50	19.2	0.28
10	50 - 500	165	2.2

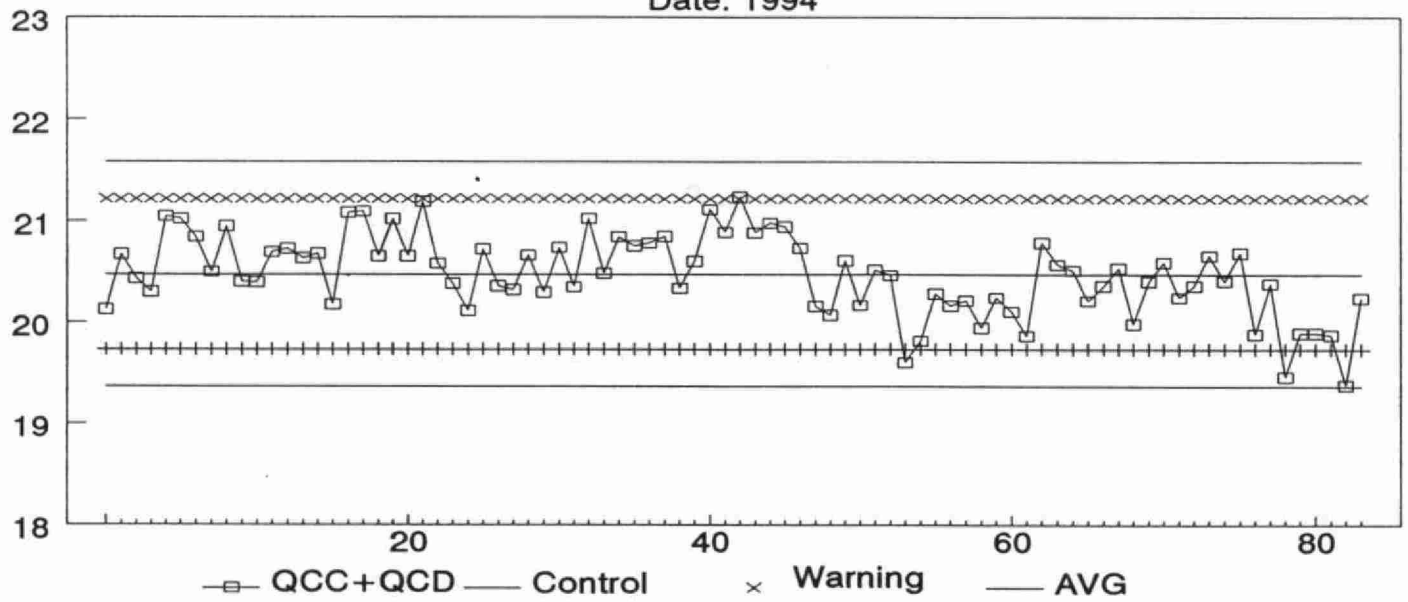
QC Difference Plot – Sodium

Date: 1994



QC Sum Plot – Sodium

Date: 1994



Sodium (Reactive)

Quality Control Data from 950101 to 951231

Analytical Range: 0.05 - 500 mg/L

Detection Limit (W): 0.05 mg/L

Sw used to calculate control limits -

Sw(C-D): 0.9635

Control Samples:

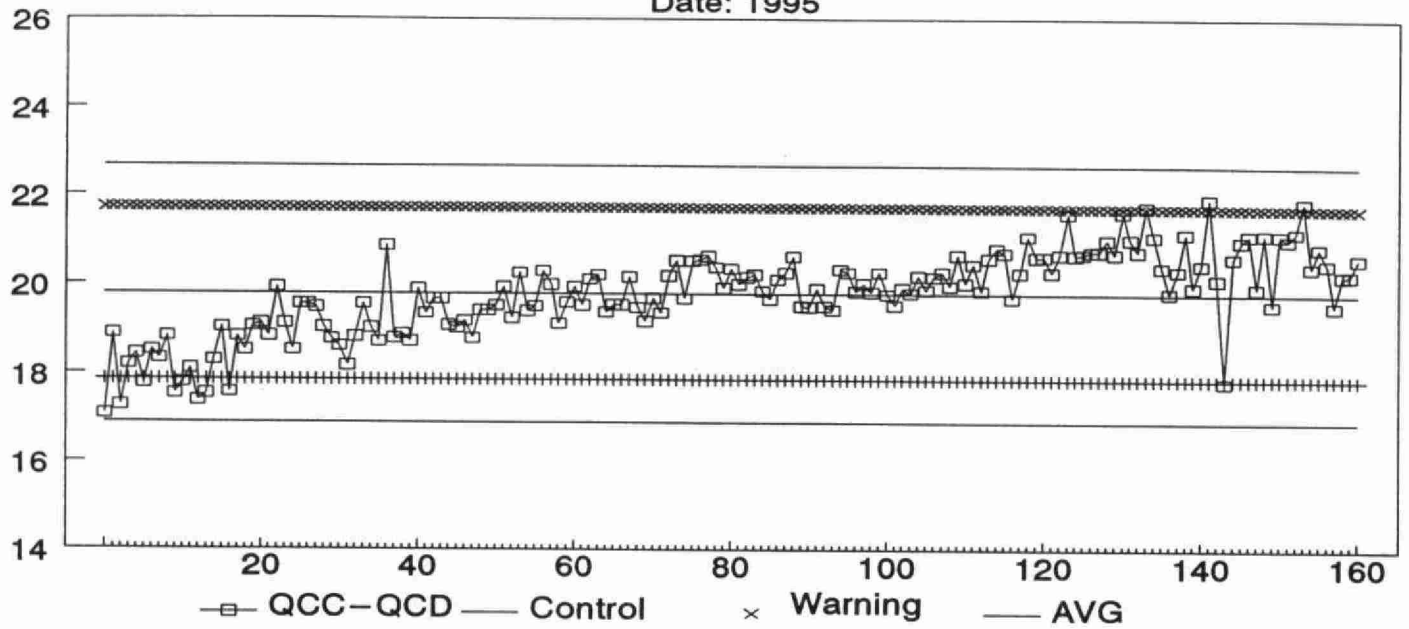
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	161	40.000	39.8752	-0.1248	1.4540
QCD:	161	20.000	20.8890	0.8890	0.6512
QCC+QCD:	161	60.000	59.9641	-0.0359	2.0360
QCC-QCD:	161	20.000	19.7863	-0.2137	0.9635

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
87	0.05 - 5	1.88	0.050
84	5 - 50	18.4	0.21
27	50 - 500	126	2.1

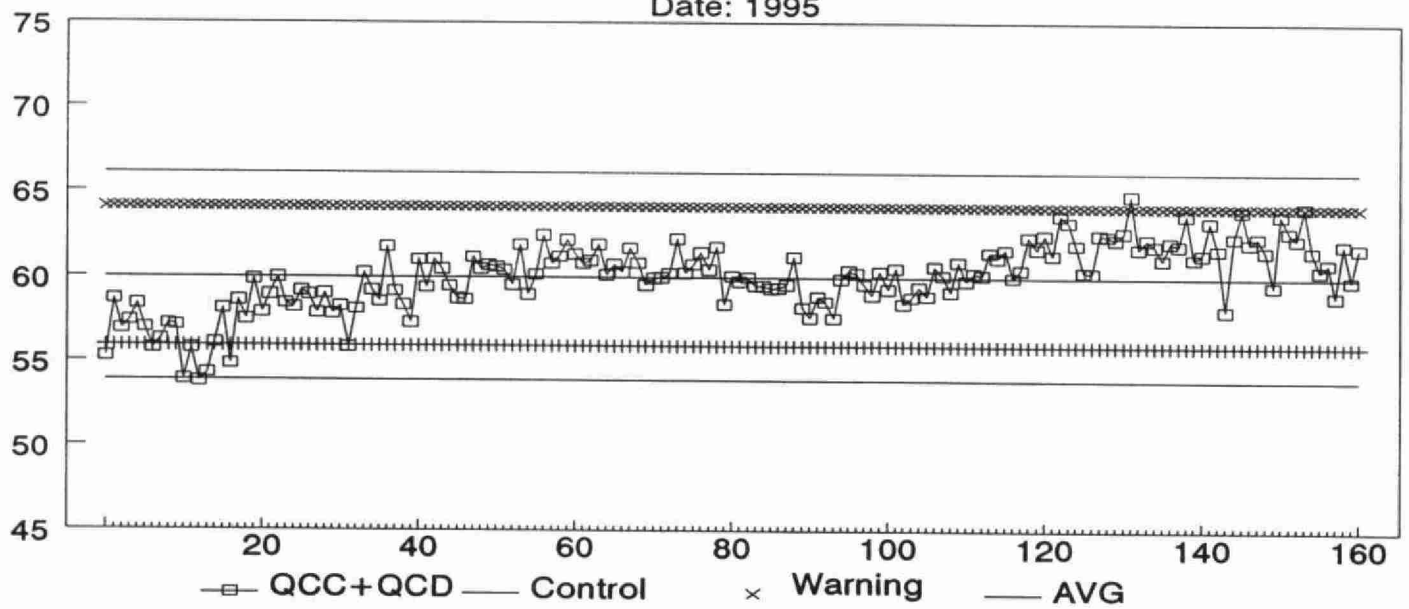
QC Difference Plot – Na

Date: 1995



QC Sum Plot – Na

Date: 1995



1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐ 15. ☐ 16. ☐ 17. ☐ 18. ☐ 19. ☐ 20. ☐ 21. ☐ 22. ☐ 23. ☐ 24. ☐ 25. ☐ 26. ☐ 27. ☐ 28. ☐ 29. ☐ 30. ☐ 31. ☐ 32. ☐ 33. ☐ 34. ☐ 35. ☐ 36. ☐ 37. ☐ 38. ☐ 39. ☐ 40. ☐ 41. ☐ 42. ☐ 43. ☐ 44. ☐ 45. ☐ 46. ☐ 47. ☐ 48. ☐ 49. ☐ 50. ☐ 51. ☐ 52. ☐ 53. ☐ 54. ☐ 55. ☐ 56. ☐ 57. ☐ 58. ☐ 59. ☐ 60. ☐ 61. ☐ 62. ☐ 63. ☐ 64. ☐ 65. ☐ 66. ☐ 67. ☐ 68. ☐ 69. ☐ 70. ☐ 71. ☐ 72. ☐ 73. ☐ 74. ☐ 75. ☐ 76. ☐ 77. ☐ 78. ☐ 79. ☐ 80. ☐ 81. ☐ 82. ☐ 83. ☐ 84. ☐ 85. ☐ 86. ☐ 87. ☐ 88. ☐ 89. ☐ 90. ☐ 91. ☐ 92. ☐ 93. ☐ 94. ☐ 95. ☐ 96. ☐ 97. ☐ 98. ☐ 99. ☐ 100. ☐

Method Title: The Determination of Mercury in Water, Industrial Waste and Sewage by Cold Vapour - Atomic Absorption Spectrophotometry (CV-AAS).

Method Introduced: 1980
Current Revision: January 27, 1995

SAMPLE MATRICES:

ANALYTICAL PROCEDURE:

Mercury in the sample is converted to the inorganic (oxidized) form by acid digestion. The mercury is then reduced being stannous chloride and the concentration measured by cold vapour atomic absorption spectroscopy.

Controls: Quality Control Solutions A, B and C

Drift: Standards reanalyzed every 20 samples

Duplicates: 1 for every 20 samples

Ref.Material: EPA1, EPA287

Interlabs: Ontario Ministry of the Environment and Energy Performance Evaluation Study

Reporting: Maximum Significant Figures: 2
Units: µg/L (ppb)

Mercury

Quality Control Data from 940101 to 941231

Analytical Range: 0.4 ug/L

Detection Limit (W): 0.01 ug/L

Sw used to calculate control limits -

Sw(A-B): 0.0088

Control Samples:

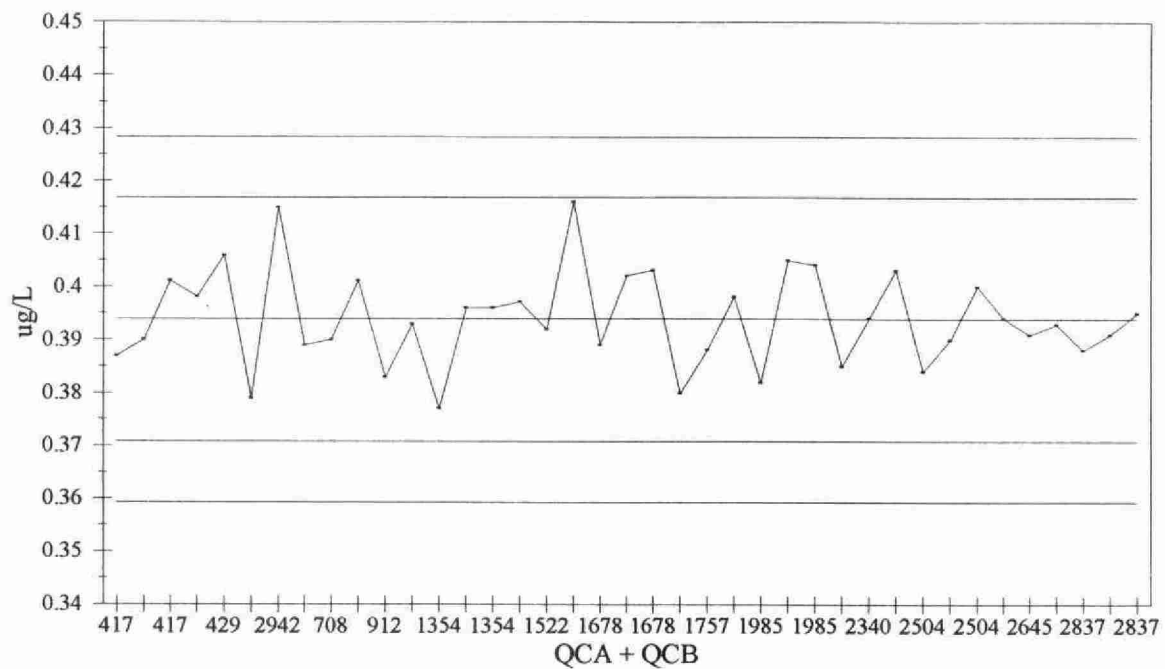
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	39	0.2931	0.2933	0.0002	0.0083
QCB:	39	0.1008	0.1006	-0.0002	0.0033
QCA+QCB:	39	0.3938	0.3940	0.0002	0.0090
QCA-QCB:	39	0.1922	0.1927	0.0005	0.0088

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
39	0.00 - 0.08	0.0098	0.0026
n/a	0.08 - 0.20	n/a	n/a
n/a	0.20 - 0.40	n/a	n/a

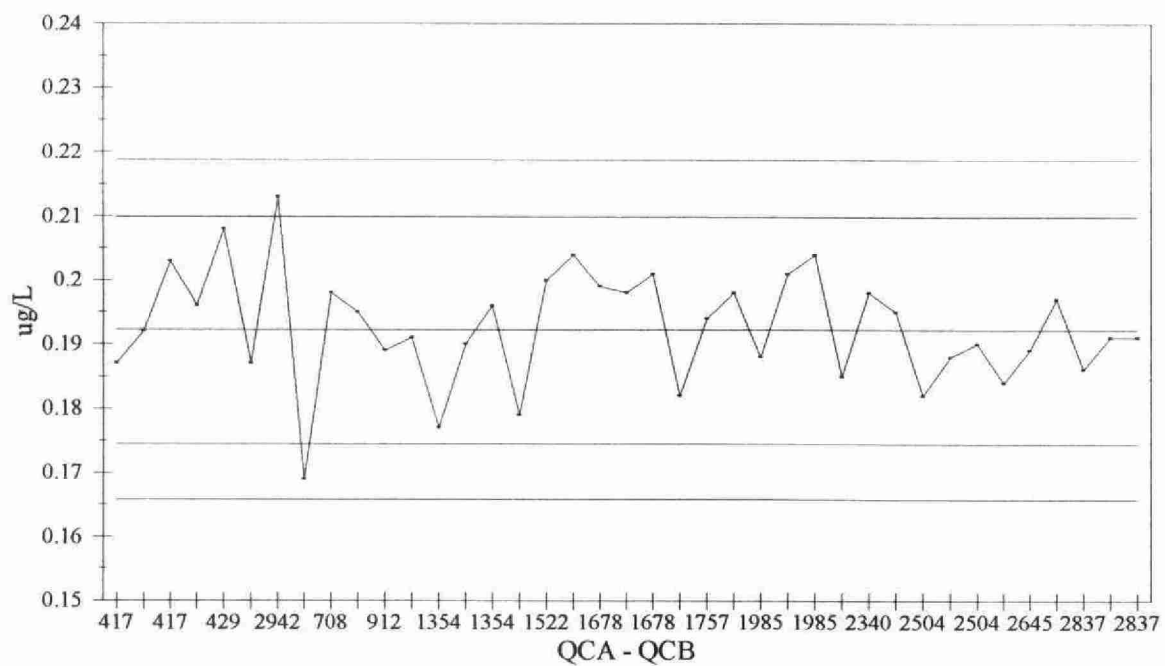
Mercury

Quality Control Data: 940101 to 941231



Mercury

Quality Control Data: 940101 to 941231



Mercury

Quality Control Data from 950101 to 951231

Analytical Range: 0.4 ug/L

Detection Limit (W): 0.01 ug/L

Sw used to calculate control limits -

Sw(A-B): 0.0088

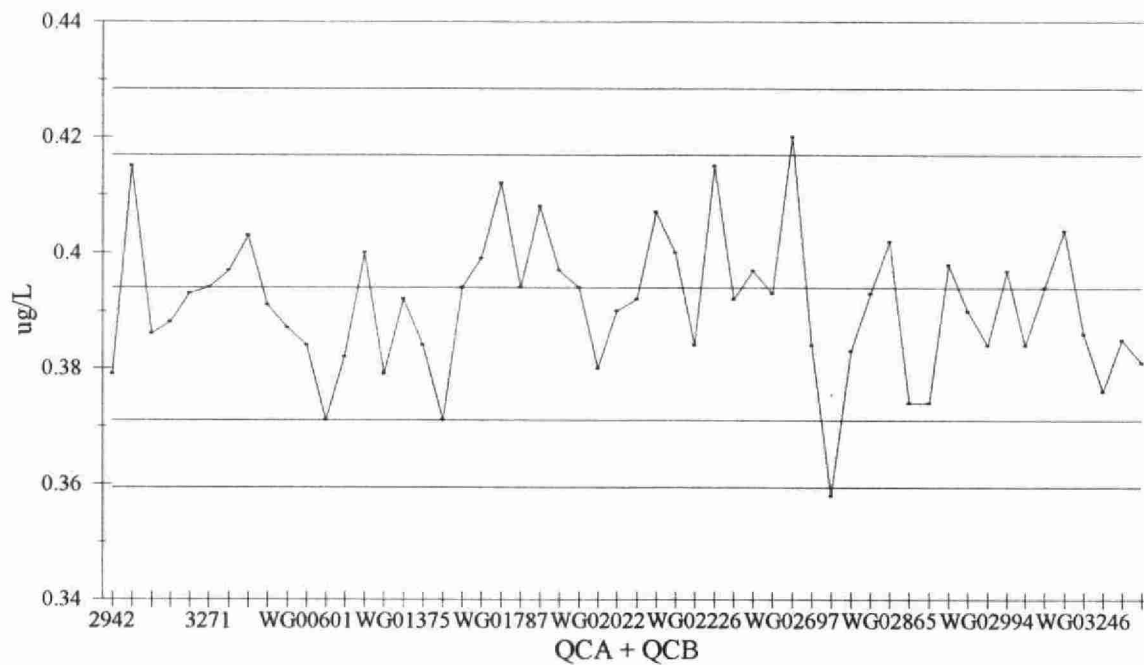
Control Samples:

	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCA:	54	0.2933	0.2919	-0.0014	0.0094
QCB:	54	0.1006	0.0990	-0.0016	0.0044
QCA+QCB:	54	0.394	0.3909	-0.0031	0.0120
QCA-QCB:	54	0.1927	0.1929	0.0002	0.0083

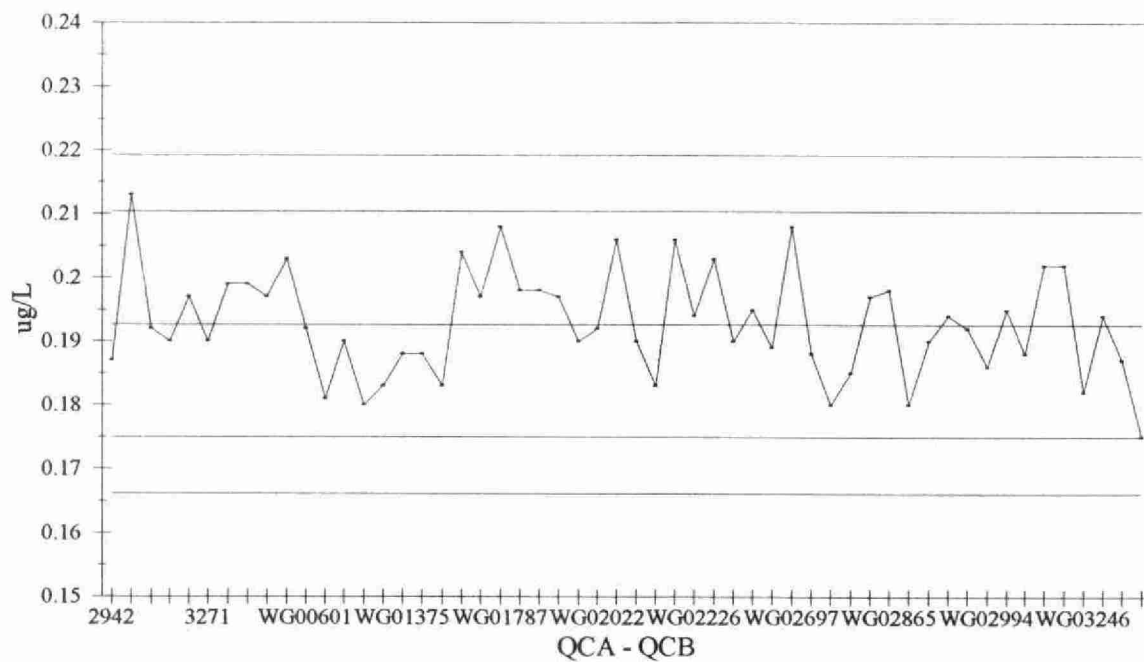
Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
55	0.00 - 0.08	0.0060	0.0010
n/a	0.08 - 0.20	n/a	n/a
n/a	0.20 - 0.40	n/a	n/a

Mercury
Quality Control Data: 950101 to 951231



Mercury
Quality Control Data: 950101 to 951231



METALS BY PRECONCENTRATION

IDENTIFICATION:

Method Title: The Determination of Trace Metals in Water by Preconcentration and Inductively Coupled Plasma - Atomic Emission Spectrophotometry (ICP-AES).

Method Number: E6043A

Method Introduced: May, 1988

Current Revision: March 31, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	Yttrium	0.1 µg/L	0.5 µg/L
	Beryllium	0.1 µg/L	0.5 µg/L
	Cadmium	0.2 µg/L	1.0 µg/L
	Chromium	0.2 µg/L	1.0 µg/L
	Molybdenum	0.2 µg/L	1.0 µg/L
	Cobalt	0.5 µg/L	2.5 µg/L
	Copper	0.5 µg/L	2.5 µg/L
	Silver	0.5 µg/L	2.5 µg/L
	Vanadium	0.5 µg/L	2.5 µg/L
	Barium	1.0 µg/L	5.0 µg/L
	Manganese	1.0 µg/L	5.0 µg/L
	Nickel	1.0 µg/L	5.0 µg/L
	Strontium	1.0 µg/L	5.0 µg/L
	Titanium	1.0 µg/L	5.0 µg/L
	Zinc	1.0 µg/L	5.0 µg/L
	Lead	2.0 µg/L	10.0 µg/L
	Aluminum	5.0 µg/L	25.0 µg/L
	Iron	5.0 µg/L	25.0 µg/L

SAMPLE MATRICES:

Sample matrices analyzed are domestic water, surface water and groundwater.

ANALYTICAL PROCEDURE:

Samples are subjected to nitric acid digestion/preconcentration followed by analysis by ICP-AES.

CONTROLS AND QUALITY ASSURANCE:

Controls: Blank
 Quality Control Solutions C and D
 Quality Control Solution E (Ag only)

Drift: QCD and QCE analyzed every 20 samples

Duplicates: 1 for every 20 samples

Ref.Material: ERA PP/CLP Trace Metals Standard
 EPA ICAP 7
 EPA ICAP 19

Interlabs: CAEAL Certified
 Ontario Ministry of the Environment and Energy Performance Evaluation Study
 Great Lakes Action Program (GLAP)

Reporting: Maximum Significant Figures: 2
 Units: µg/L (ppb)

Aluminum (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 5-5,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.1609

Control Samples:

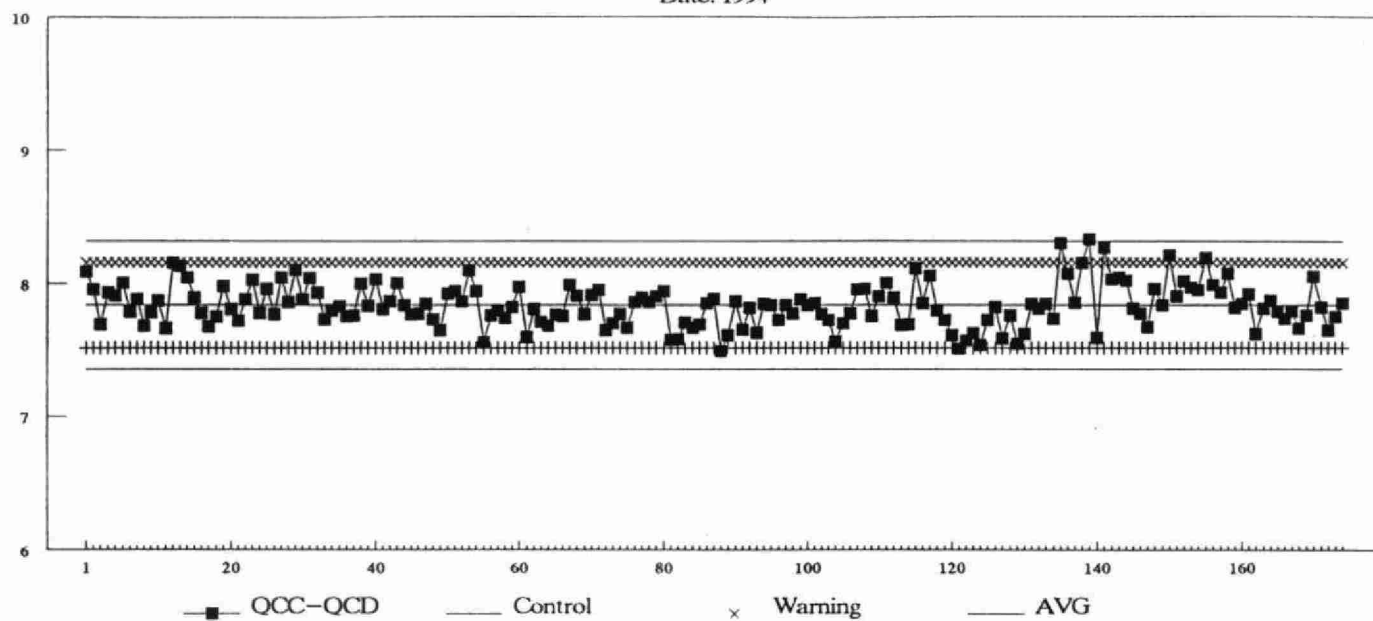
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	175	10.000	9.7901	-0.2099	0.1917
QCD:	175	2.000	1.9537	-0.0463	0.0607
QCC+QCD:	175	12.000	11.7439	-0.2561	0.2345
QCC-QCD:	175	8.000	7.8364	-0.1636	0.1609

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
156	5 - 500	77.10	5.95
14	500 - 5000	1630.00	127.00
n/a	5000 - 50000	n/a	n/a

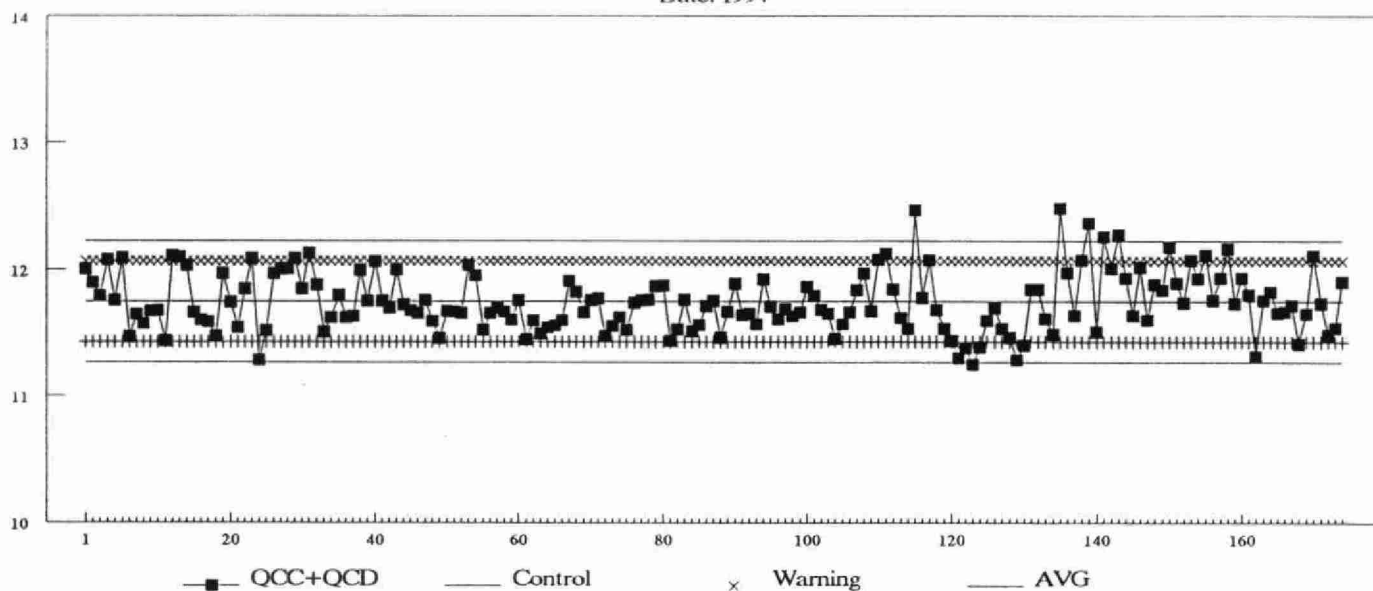
QC Difference Preconc. - AI

Date: 1994



QC Sum Preconc. - AI

Date: 1994



Aluminum (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 5-5,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.1557

Control Samples:

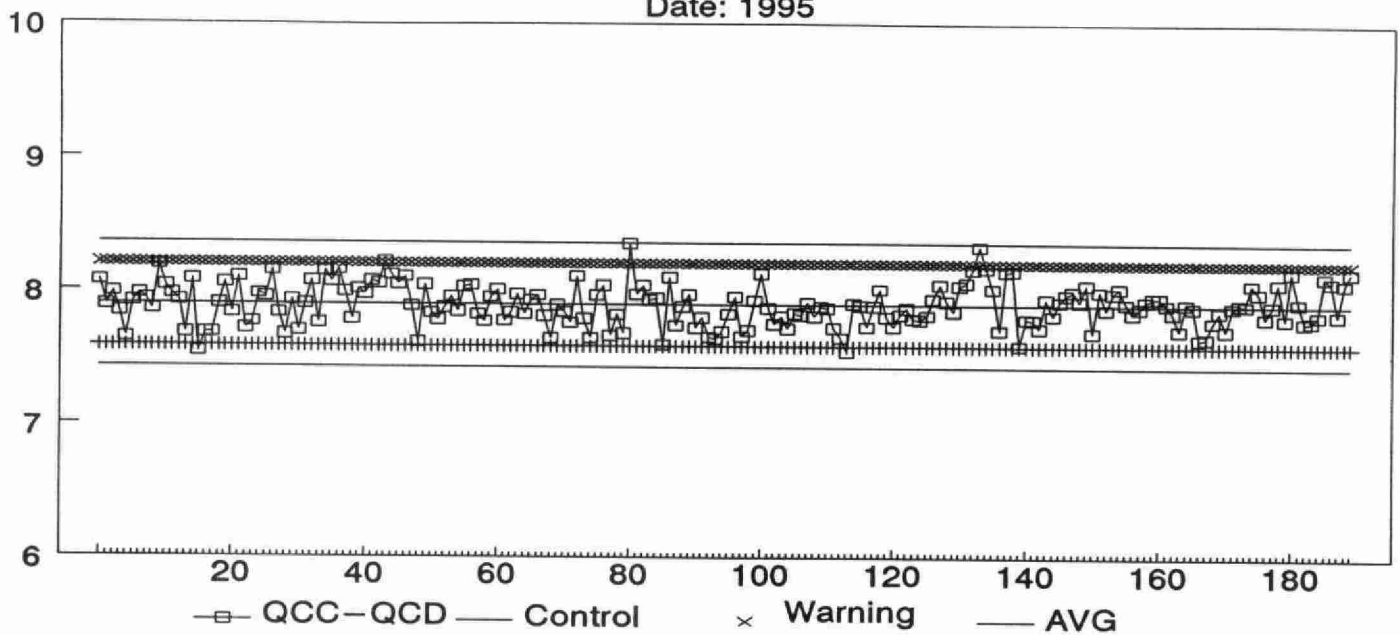
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	190	10.000	9.8556	-0.1444	0.1857
QCD:	190	2.000	1.9609	-0.0391	0.0453
QCC+QCD:	190	12.000	11.8165	-0.1835	0.2210
QCC-QCD:	190	8.000	7.8946	-0.1054	0.1557

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
153	5 - 500	73.90	4.44
16	500 - 5000	1041.00	18.00
n/a	5000 - 50000	n/a	n/a

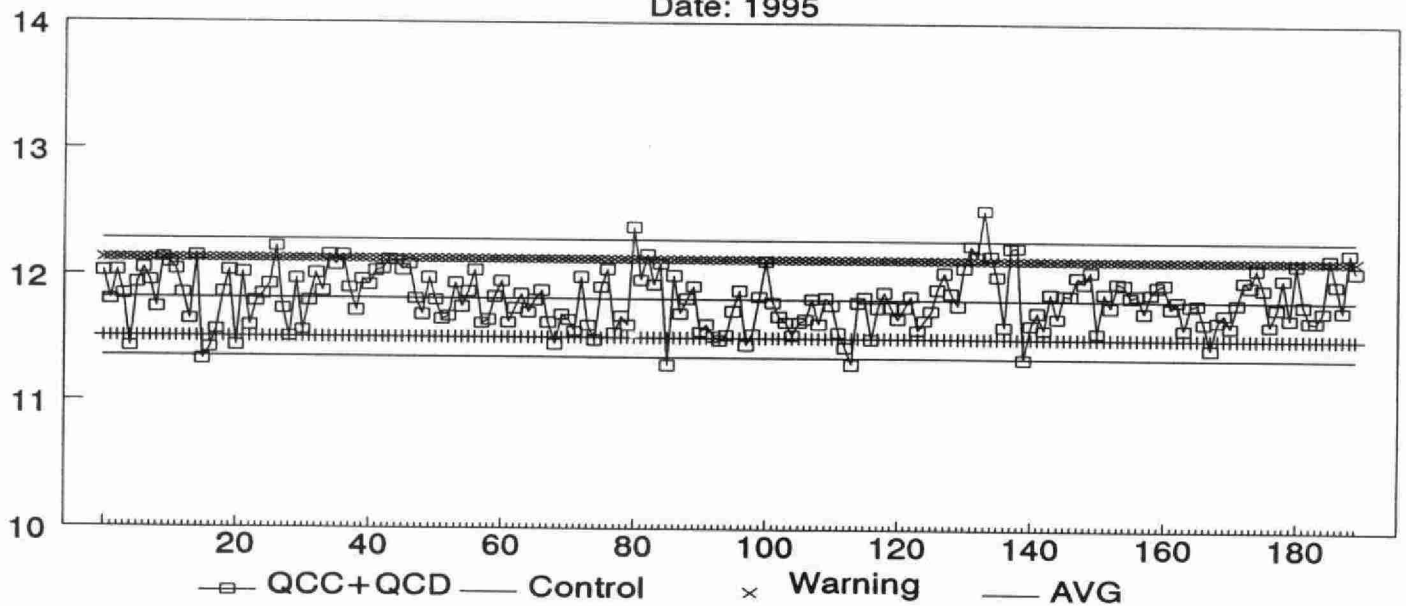
QC Difference Preconc. - AI

Date: 1995



QC Sum Preconc. - AI

Date: 1995



Barium (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 1-10,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0222

Control Samples:

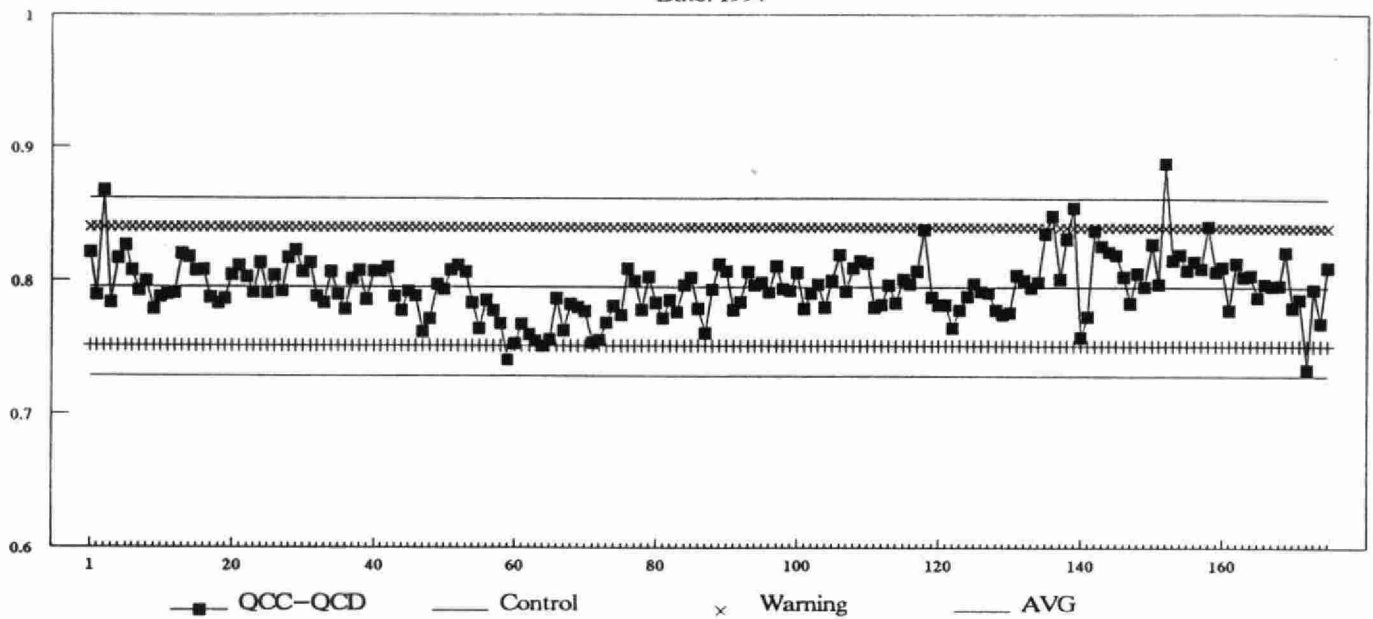
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	176	1.000	0.9905	-0.0095	0.0266
QCD:	176	0.200	0.1954	-0.0046	0.0091
QCC+QCD:	176	1.200	1.1859	-0.0141	0.0329
QCC-QCD:	176	0.800	0.7952	-0.0048	0.0222

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
172	1 - 100	21.70	1.17
10	100 - 1000	193.00	3.37
n/a	1000 - 10000	n/a	n/a

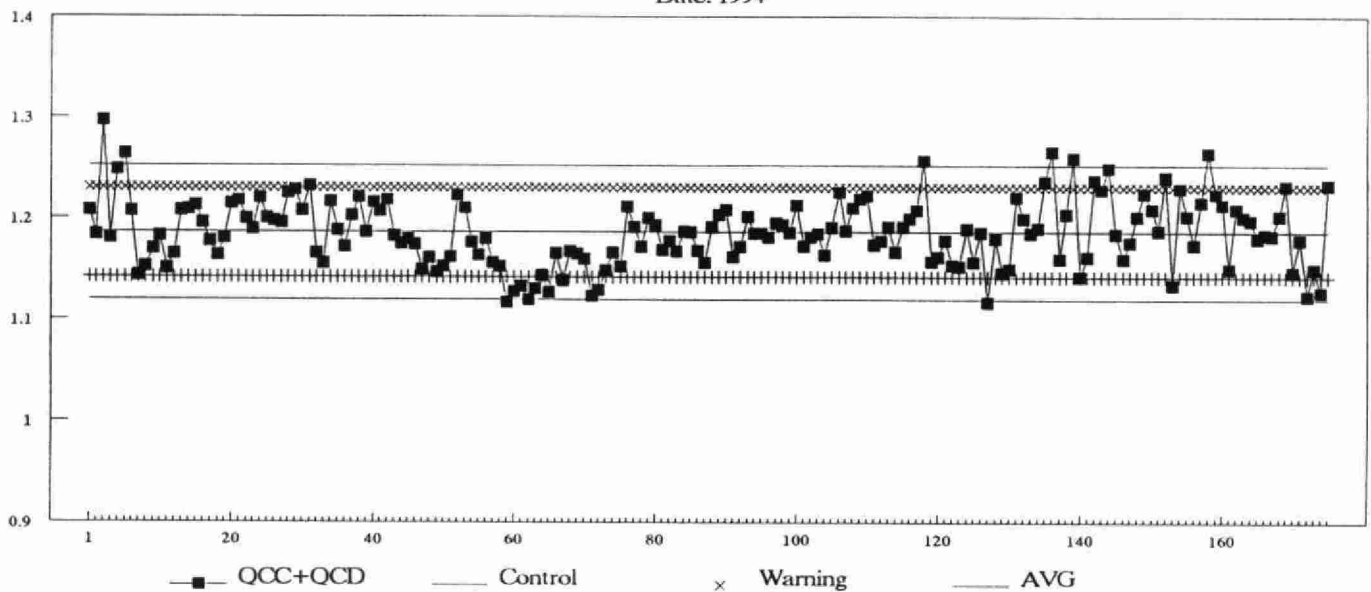
QC Difference Preconc. - Ba

Date: 1994



QC Sum Preconc. - Ba

Date: 1994



Barium (Total) - Preconcentrated**Quality Control Data from 950101 to 951231**

Analytical Range: 1-10,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0230

Control Samples:

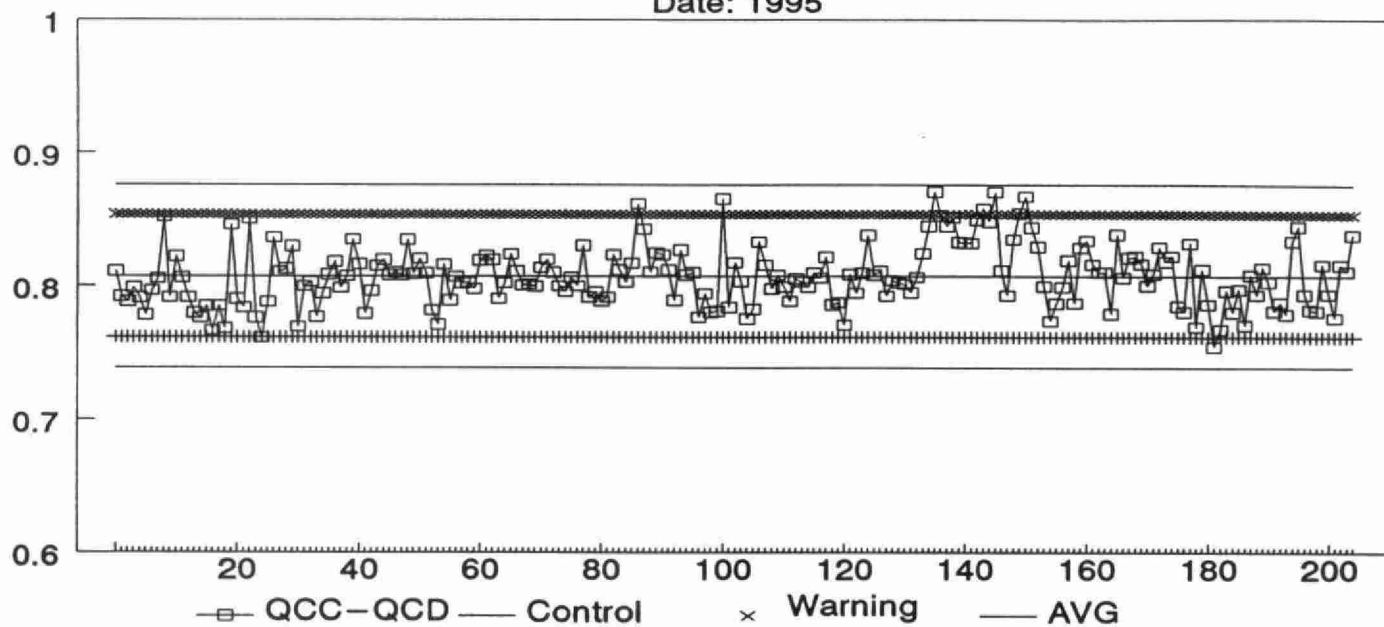
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	205	1.000	1.0060	0.0060	0.0267
QCD:	205	0.200	0.1986	-0.0014	0.0060
QCC+QCD:	205	1.200	1.2046	0.0046	0.0312
QCC-QCD:	205	0.800	0.8074	0.0074	0.0230

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
167	1 - 100	22.20	0.87
13	100 - 1000	207.00	4.70
n/a	1000 - 10000	n/a	n/a

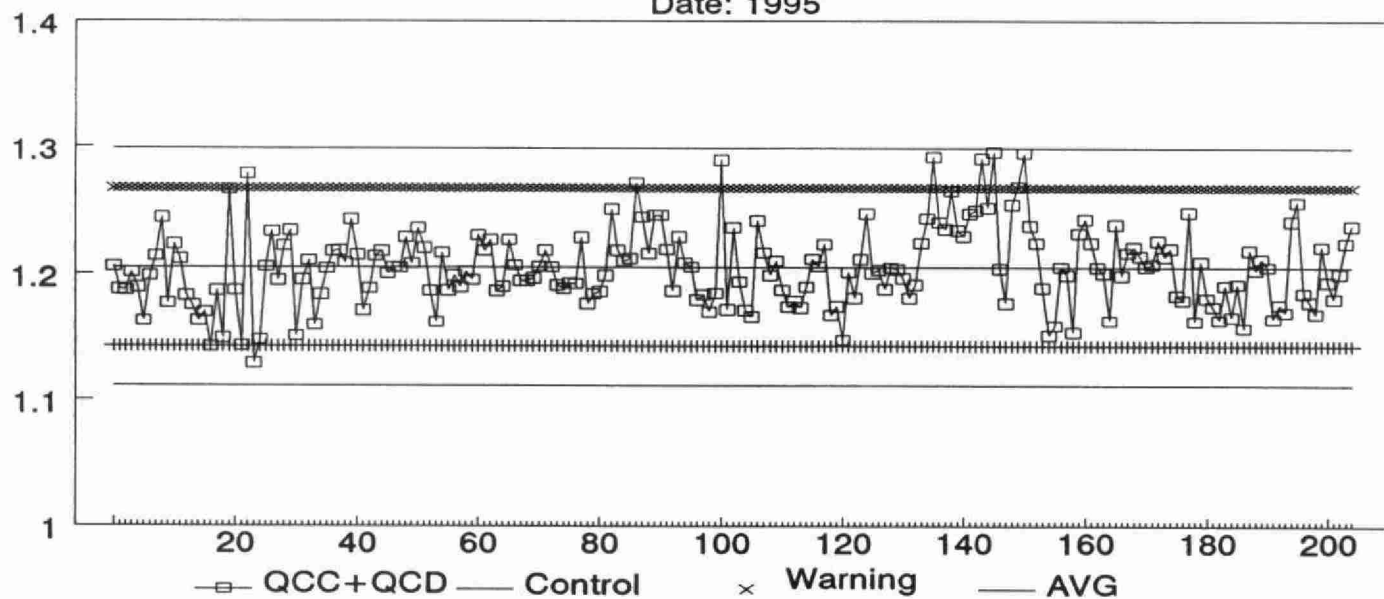
QC Difference Preconc. - Ba

Date: 1995



QC Sum Preconc. - Ba

Date: 1995



Beryllium (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 1-10,000 ug/L

Detection Limit (W): 0.1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0363

Control Samples:

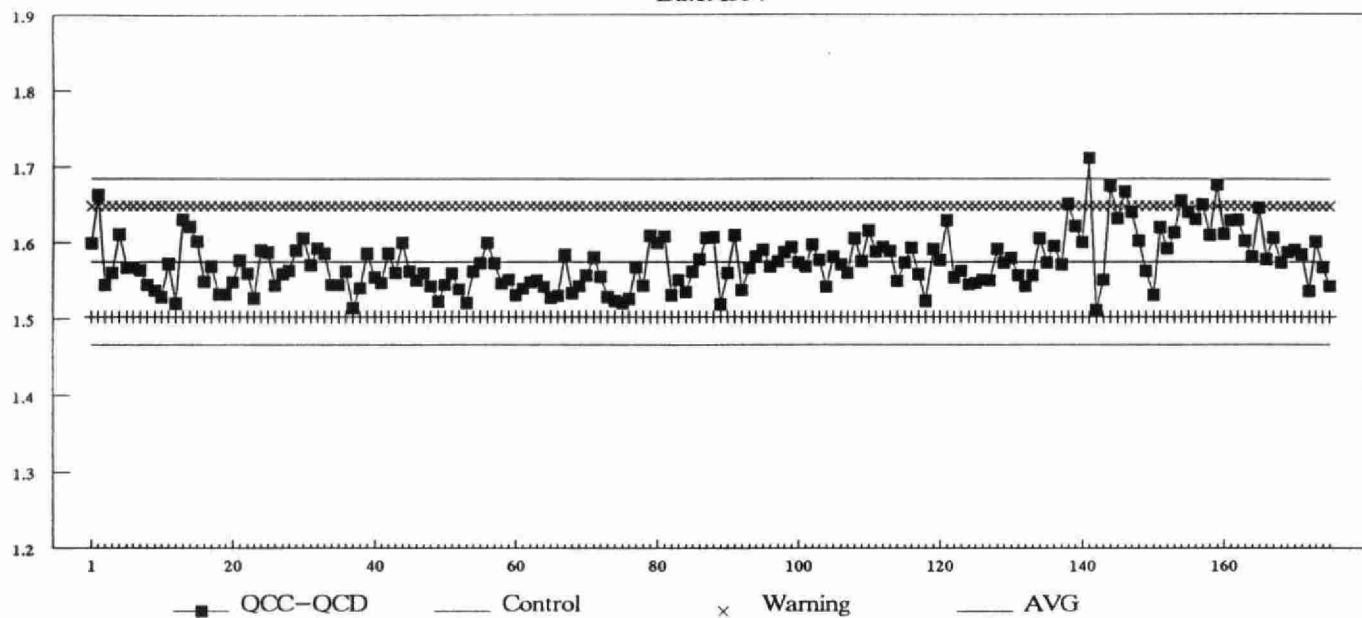
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	176	2.000	1.9646	-0.0354	0.0430
QCD:	176	0.400	0.3894	-0.0106	0.0087
QCC+QCD:	176	2.400	2.3540	-0.0460	0.0503
QCC-QCD:	176	1.600	1.5752	-0.0248	0.0363

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
184	0.1 - 10	0.17	0.03
n/a	10 - 100	n/a	n/a
n/a	100 - 1000	n/a	n/a

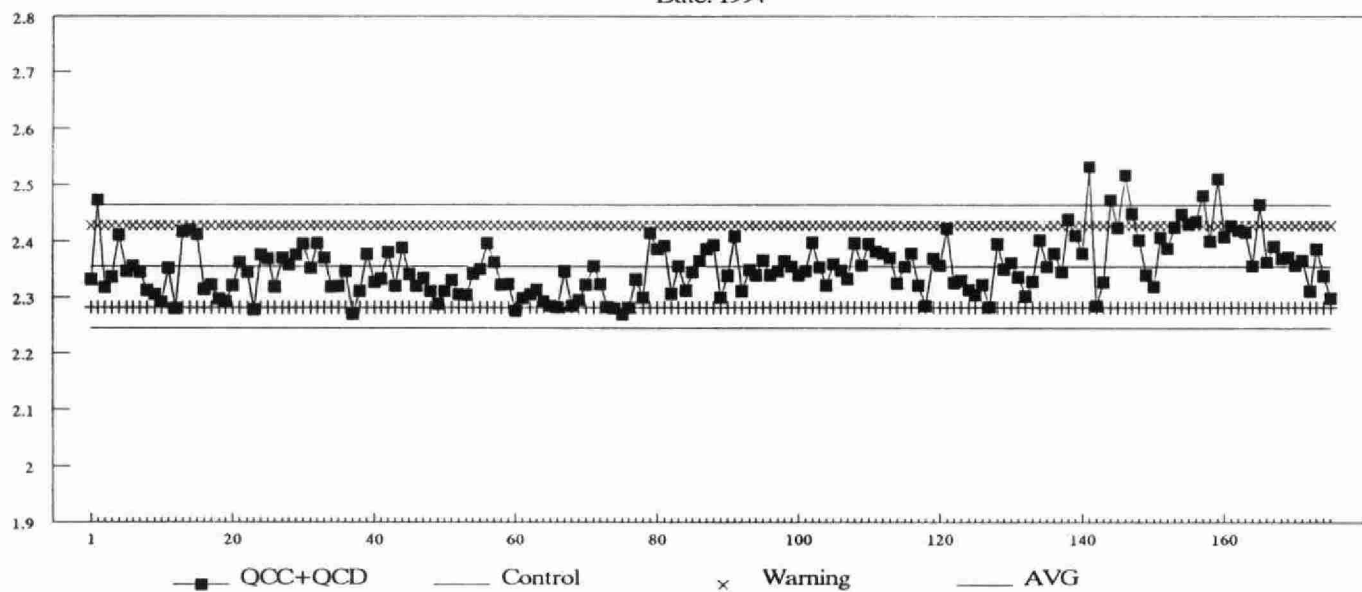
QC Difference Preconc. - Be

Date: 1994



QC Sum Preconc. - Be

Date: 1994



Beryllium (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 1-10,000 ug/L

Detection Limit (W): 0.1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0331

Control Samples:

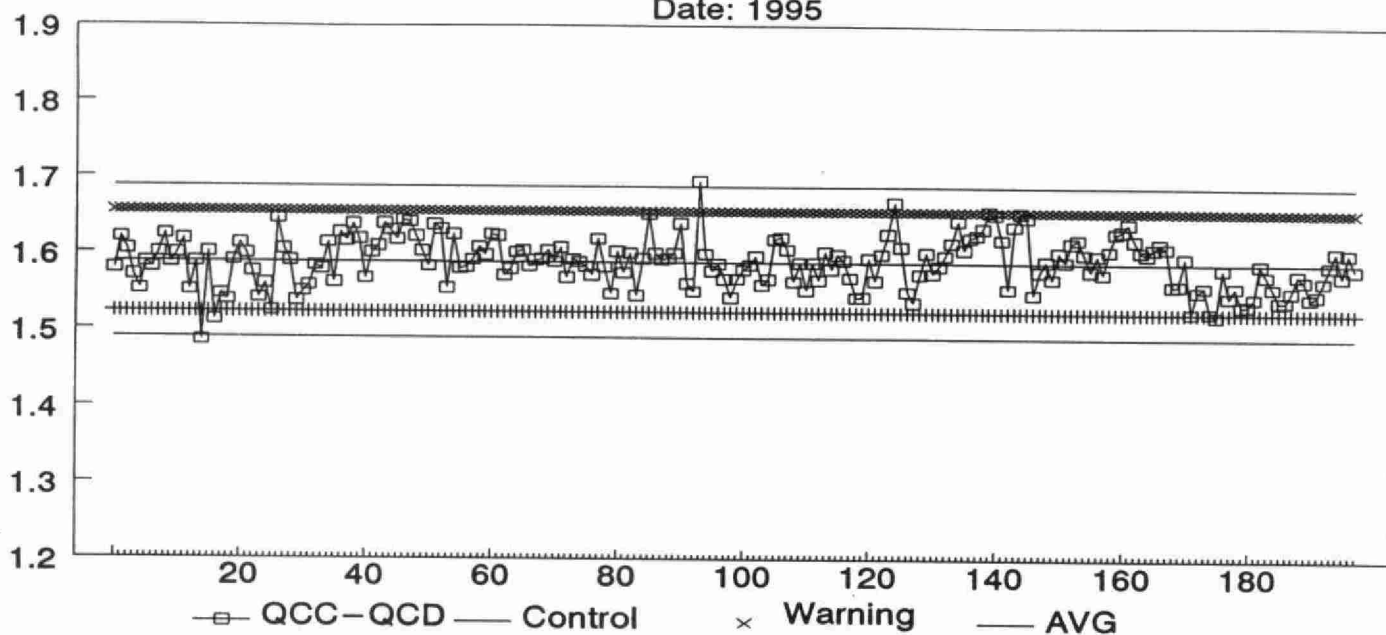
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	198	2.000	1.9726	-0.0274	0.0381
QCD:	198	0.400	0.3841	-0.0159	0.0076
QCC+QCD:	198	2.400	2.3567	-0.0433	0.0439
QCC-QCD:	198	1.600	1.5885	-0.0115	0.0331

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
183	0.1 - 10	0.10	0.03
n/a	10 - 100	n/a	n/a
n/a	100 - 1000	n/a	n/a

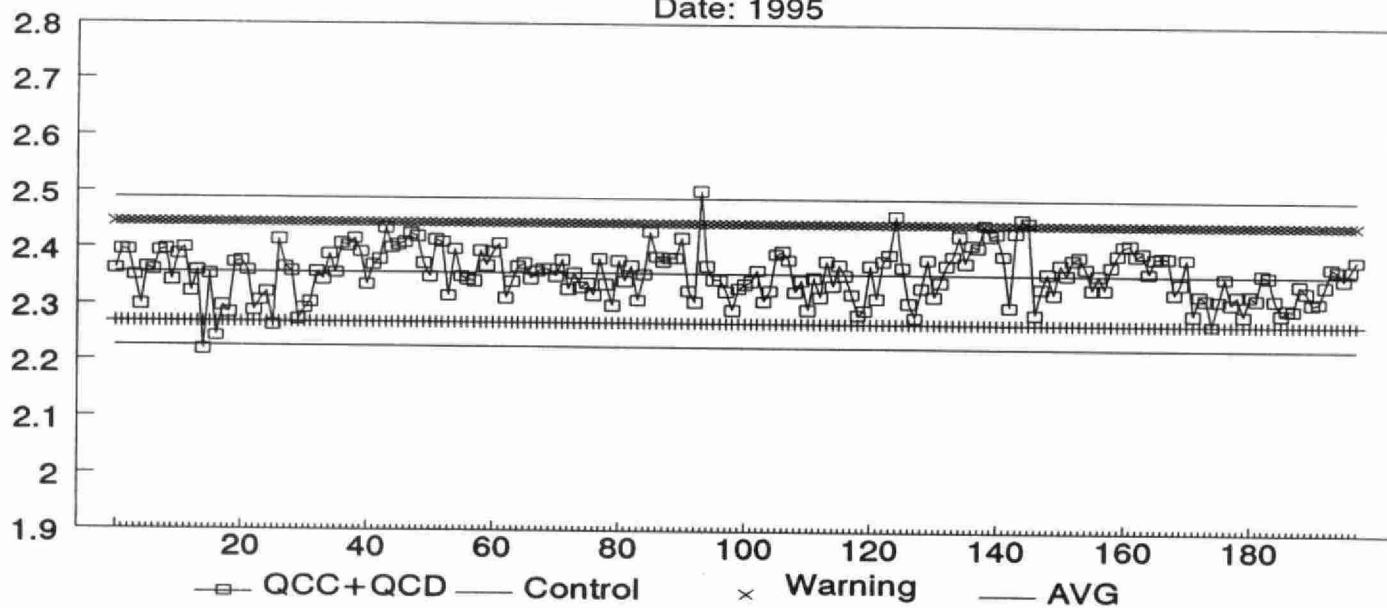
QC Difference Preconc. - Be

Date: 1995



QC Sum Preconc. - Be

Date: 1995



Cadmium (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 0.2 - 15,000 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0208

Control Samples:

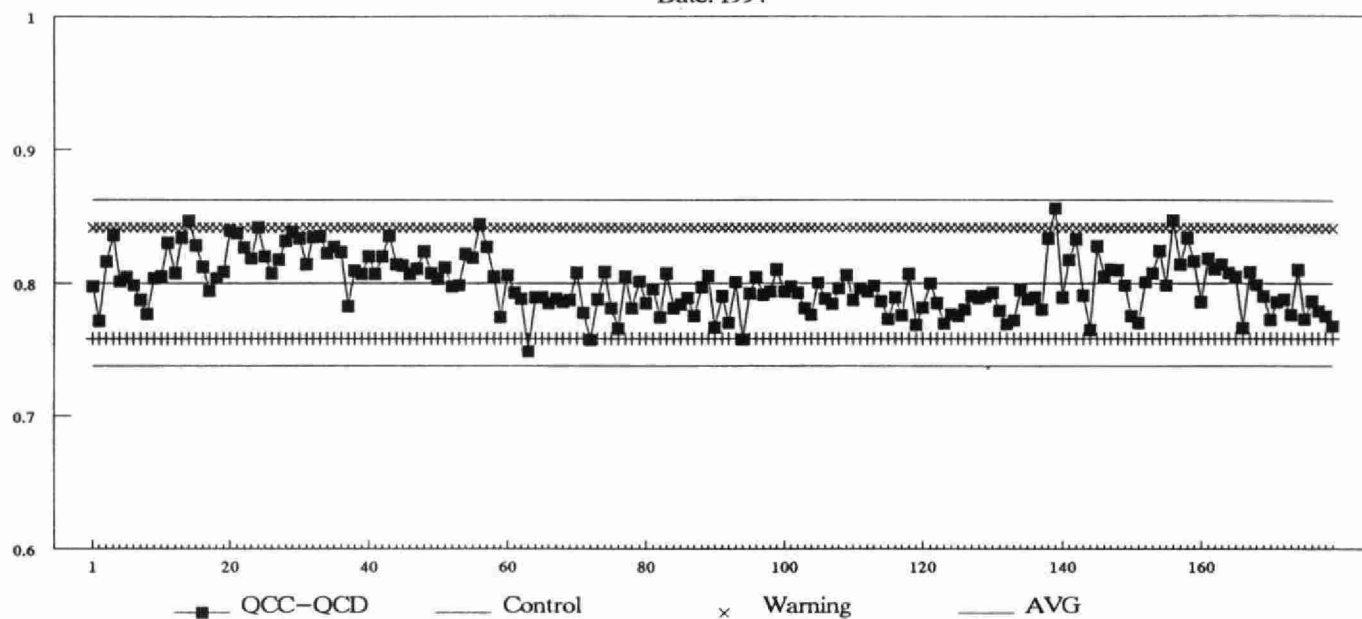
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	180	1.000	0.9986	-0.0014	0.0242
QCD:	180	0.200	0.1989	-0.0011	0.0053
QCC+QCD:	180	1.200	1.1975	-0.0025	0.0281
QCC-QCD:	180	0.800	0.7997	-0.0003	0.0208

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
132	0.2 - 20	0.21	0.175
n/a	20 - 200	n/a	n/a
n/a	200 - 2000	n/a	n/a

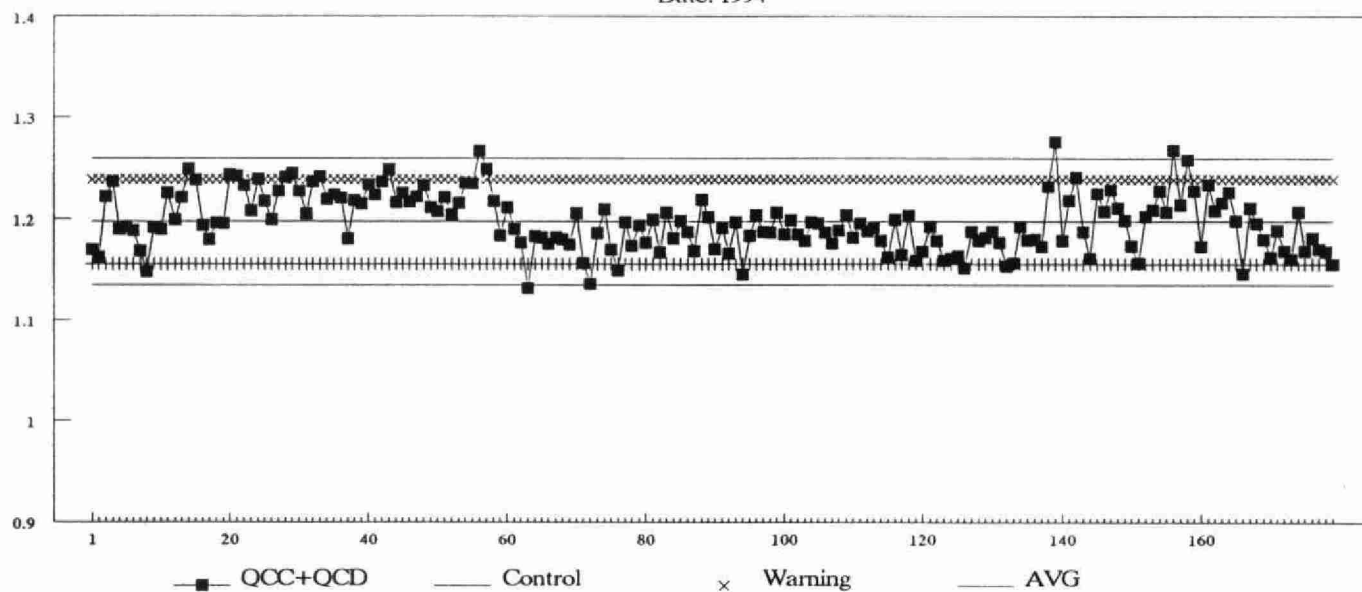
QC Difference Preconc. - Cd

Date: 1994



QC Sum Preconc. - Cd

Date: 1994



Cadmium (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 0.2 - 15,000 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0183

Control Samples:

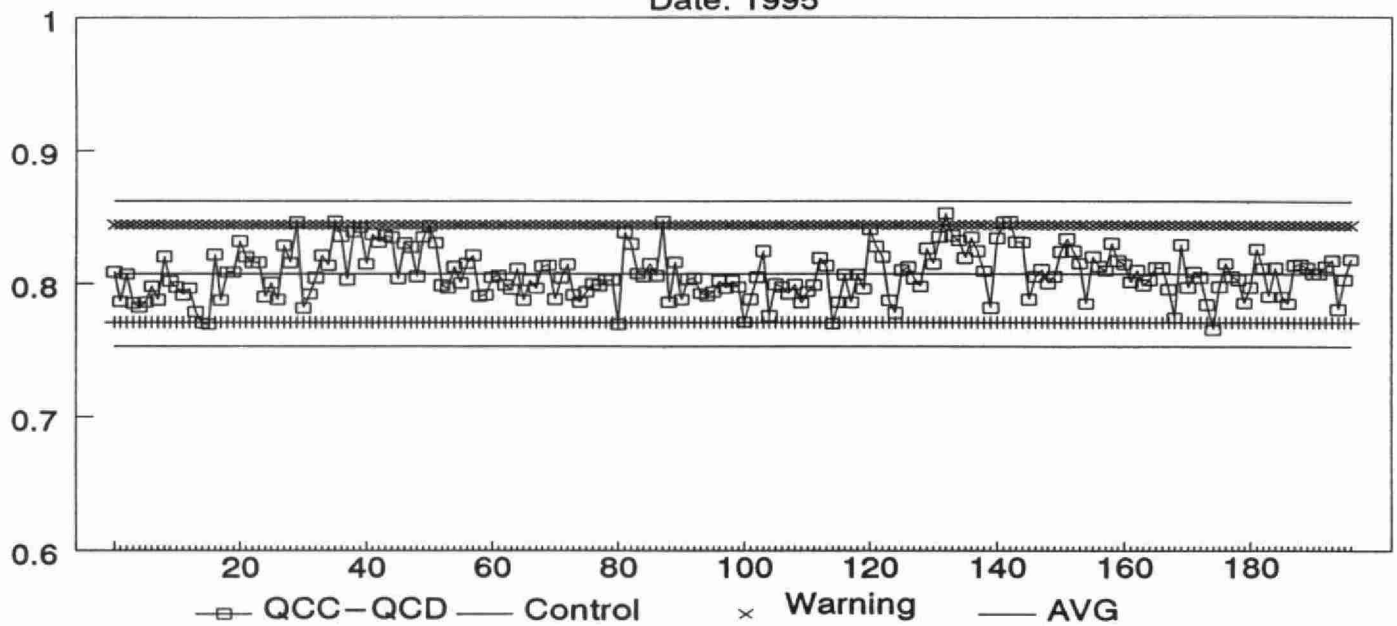
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	197	1.000	1.0063	0.0063	0.0219
QCD:	197	0.200	0.1988	-0.0012	0.0046
QCC+QCD:	197	1.200	1.2051	0.0051	0.0258
QCC-QCD:	197	0.800	0.8075	0.0075	0.0183

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
182	0.2 - 20	0.32	0.085
n/a	20 - 200	n/a	n/a
n/a	200 - 2000	n/a	n/a

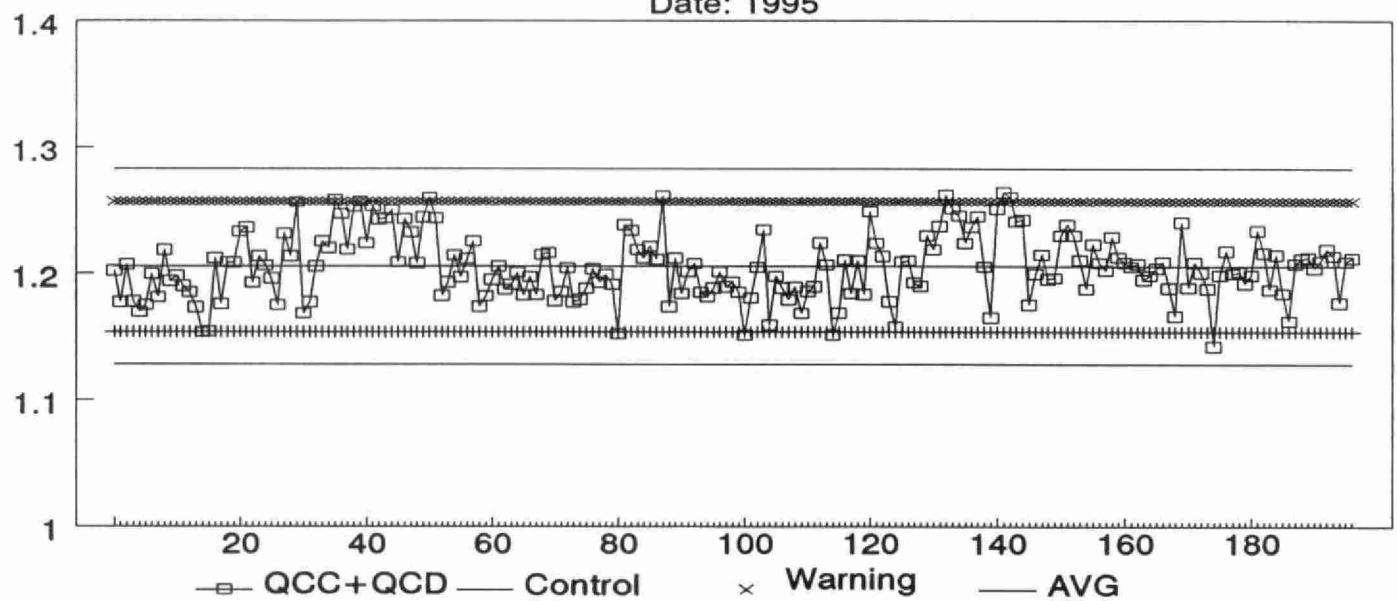
QC Difference Preconc. - Cd

Date: 1995



QC Sum Preconc. - Cd

Date: 1995



Chromium (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 0.2 - 15,000 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0482

Control Samples:

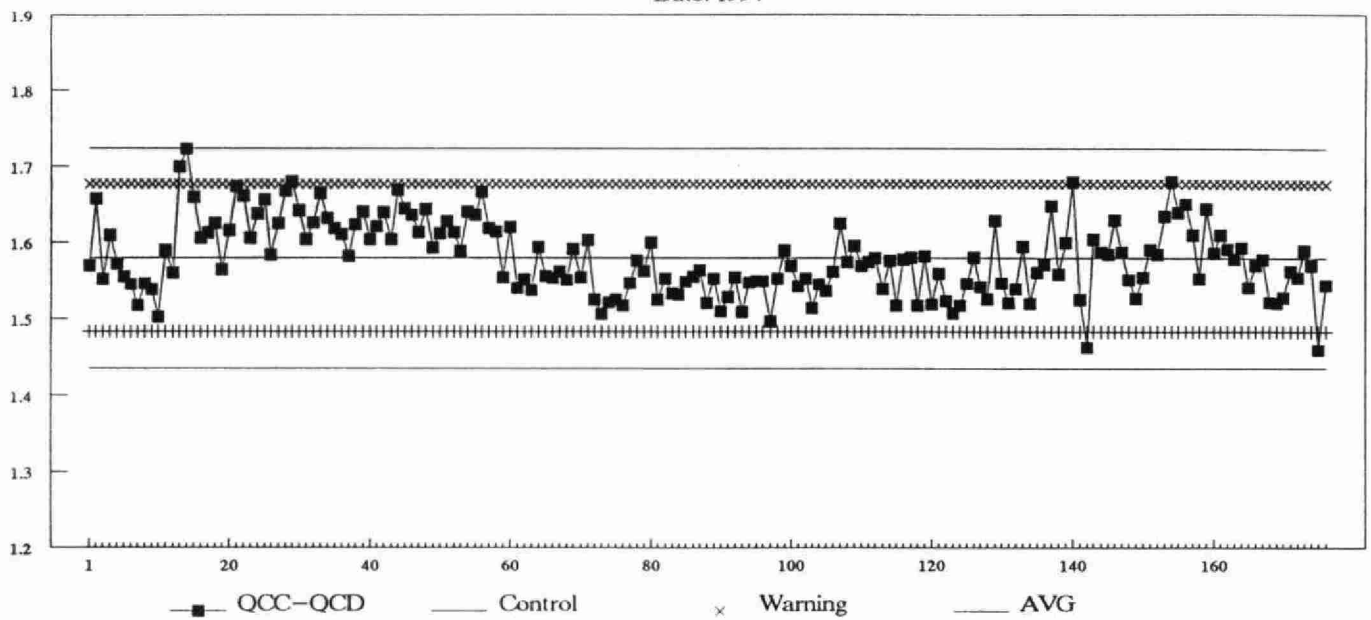
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	177	2.000	1.9592	-0.0408	0.0590
QCD:	177	0.400	0.3793	-0.0207	0.0146
QCC+QCD:	177	2.400	2.3385	-0.0615	0.0712
QCC-QCD:	177	1.600	1.5800	-0.0200	0.0482

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
175	0.2 - 20	0.91	0.319
n/a	20 - 200	n/a	n/a
n/a	200 - 2000	n/a	n/a

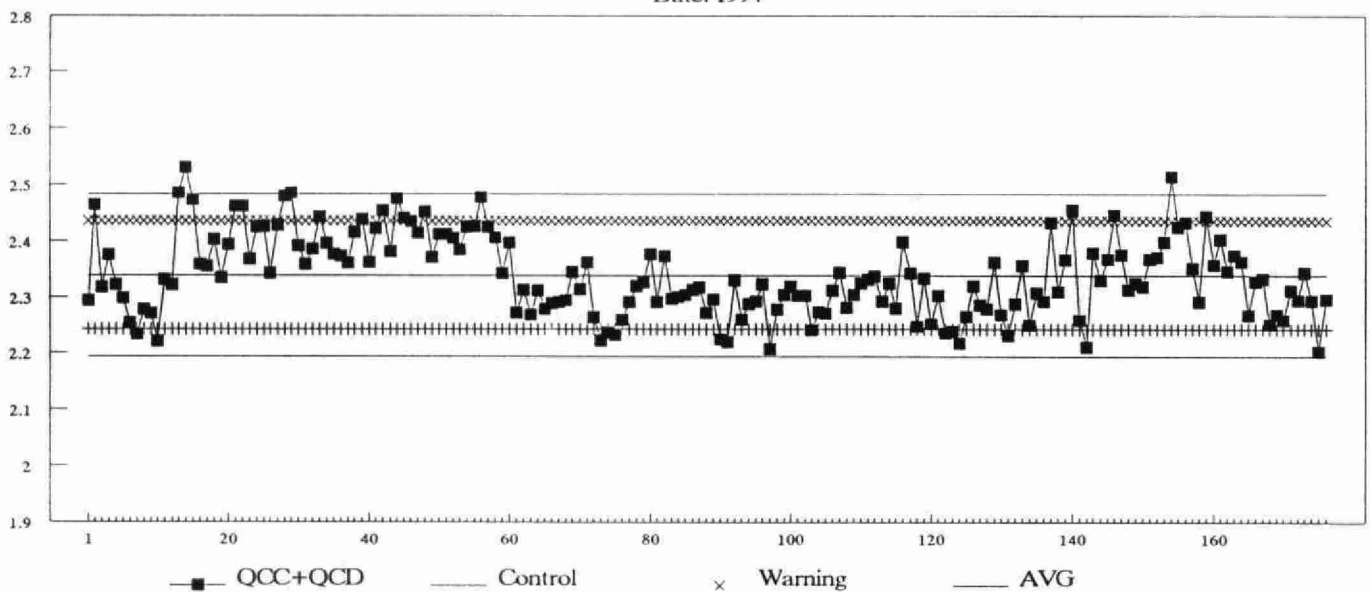
QC Difference Preconc. - Cr

Date: 1994



QC Sum Preconc. - Cr

Date: 1994



Chromium (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 0.2 - 15,000 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0382

Control Samples:

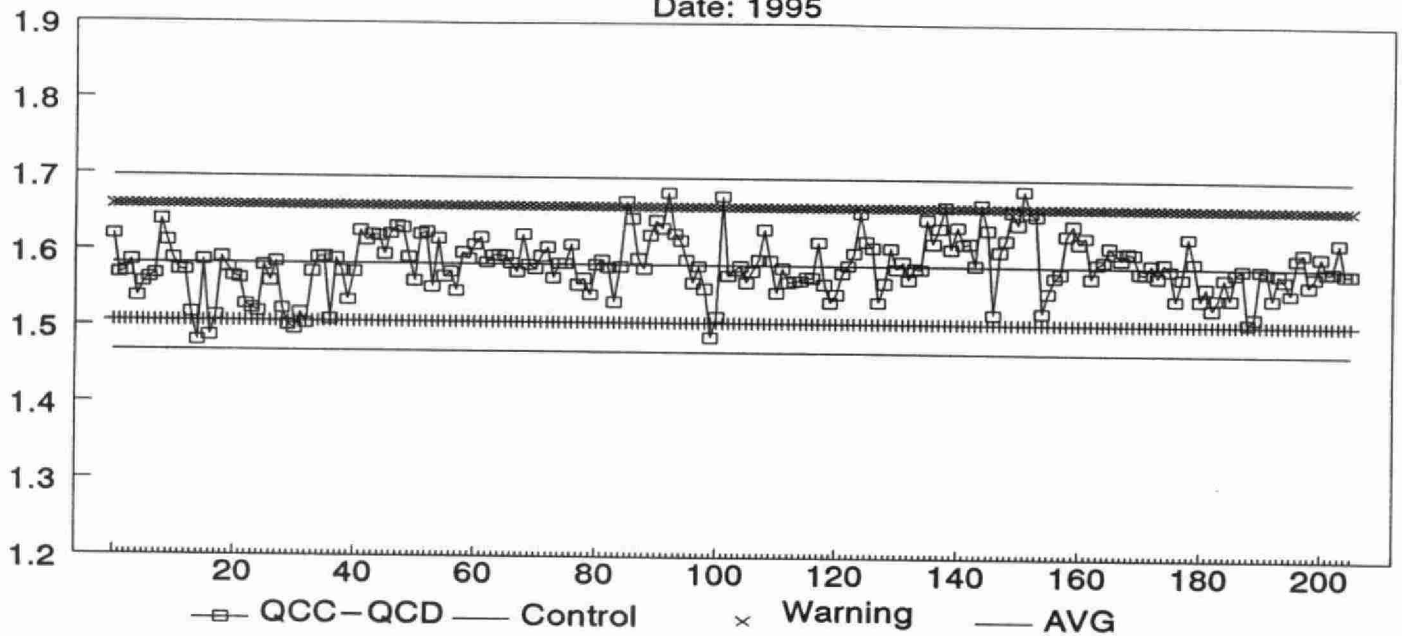
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	206	2.000	1.9634	-0.0366	0.0457
QCD:	206	0.400	0.3810	-0.0190	0.0108
QCC+QCD:	206	2.400	2.3444	-0.0556	0.0544
QCC-QCD:	206	1.600	1.5824	-0.0176	0.0382

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
176	0.2 - 20	1.00	0.200
6	20 - 200	75	1.1
n/a	200 - 2000	n/a	n/a

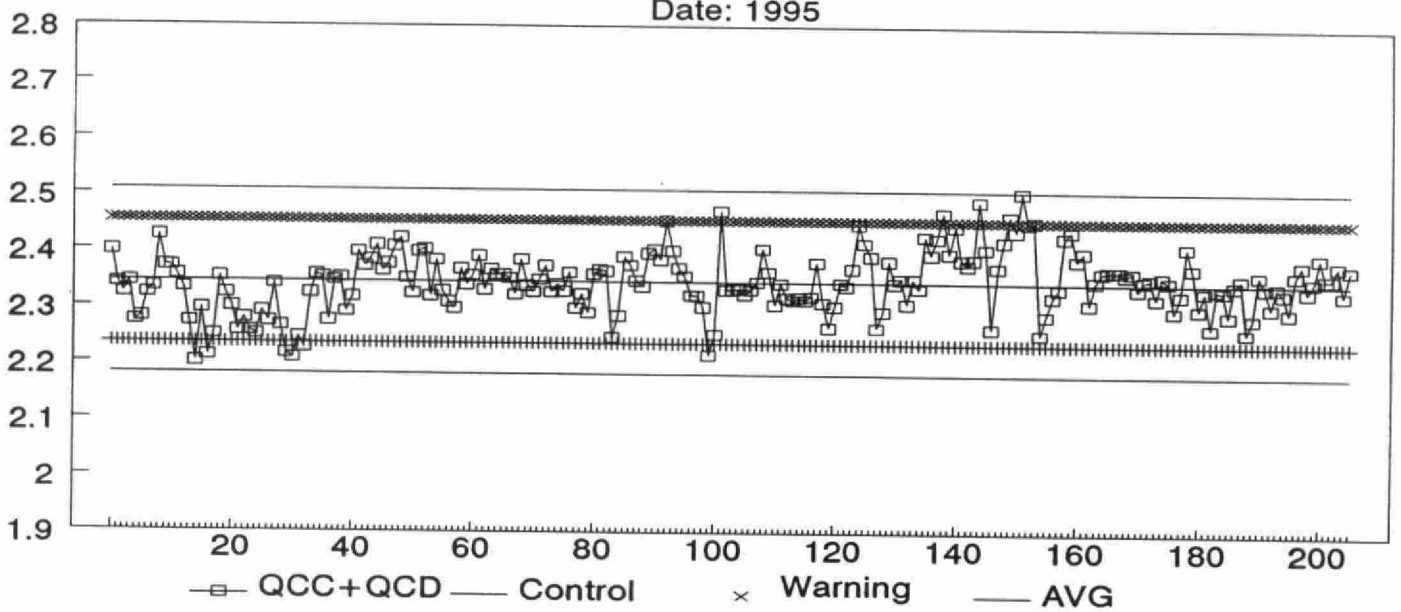
QC Difference Preconc. - Cr

Date: 1995



QC Sum Preconc. - Cr

Date: 1995



Cobalt (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 0.5 - 15,000 ug/L

Detection Limit (W): 0.5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0368

Control Samples:

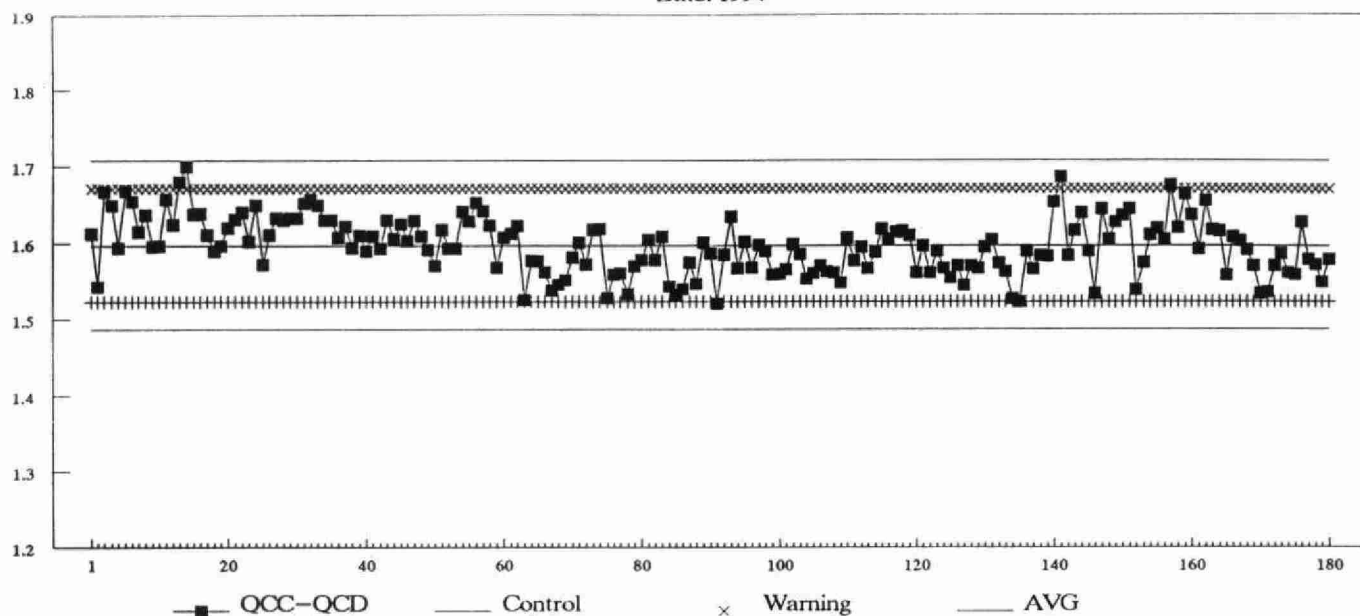
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	181	2.000	1.9959	-0.0041	0.0427
QCD:	181	0.400	0.3990	-0.0010	0.0088
QCC+QCD:	181	2.400	2.3950	-0.0050	0.0495
QCC-QCD:	181	1.600	1.5969	-0.0031	0.0368

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
178	0.5 - 50	1.30	0.209
n/a	50 - 500	n/a	n/a
n/a	500 - 5000	n/a	n/a

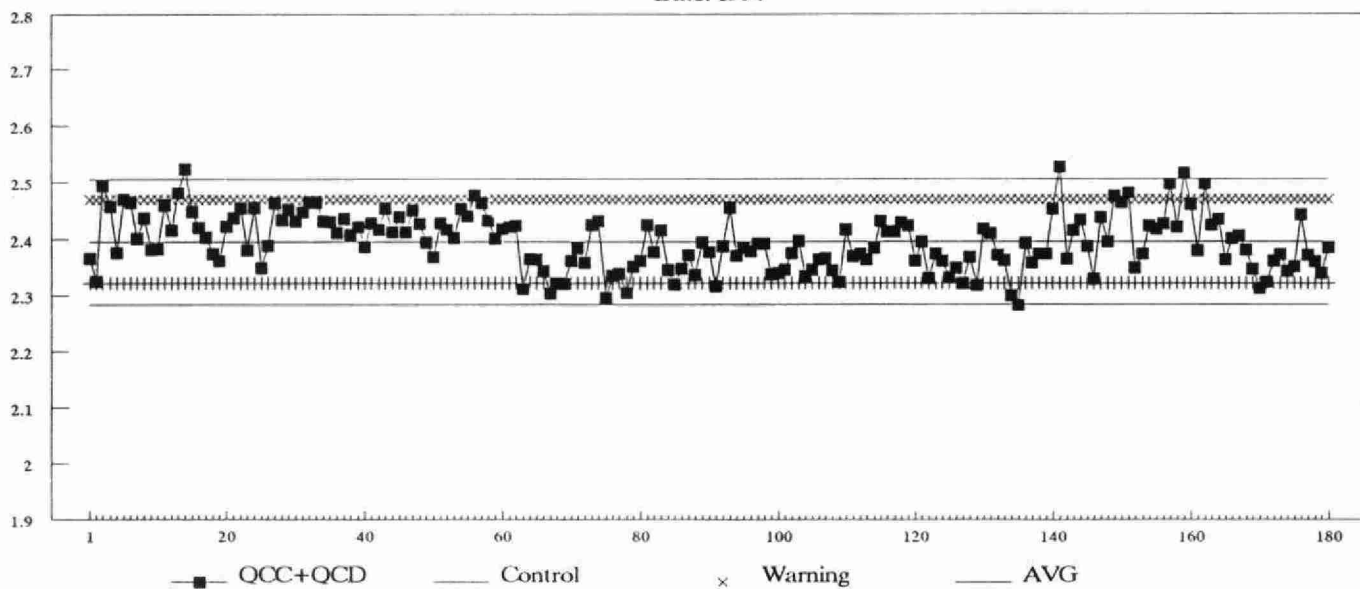
QC Difference Preconc. - Co

Date: 1994



QC Sum Preconc. - Co

Date: 1994



Cobalt (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 0.5 - 15,000 ug/L

Detection Limit (W): 0.5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0359

Control Samples:

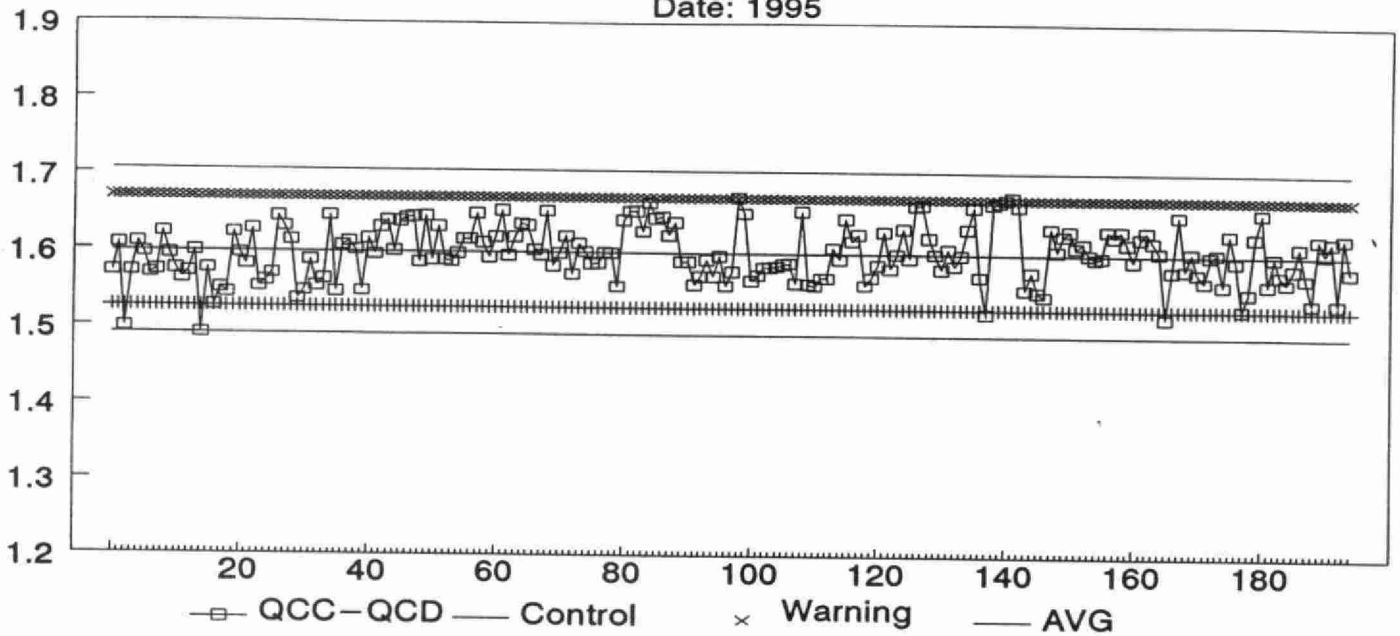
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	195	2.000	1.9923	-0.0077	0.0424
QCD:	195	0.400	0.3948	-0.0052	0.0083
QCC+QCD:	195	2.400	2.3871	-0.0129	0.0495
QCC-QCD:	195	1.600	1.5975	-0.0025	0.0359

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
176	0.5 - 50	1.70	0.220
n/a	50 - 500	n/a	n/a
n/a	500 - 5000	n/a	n/a

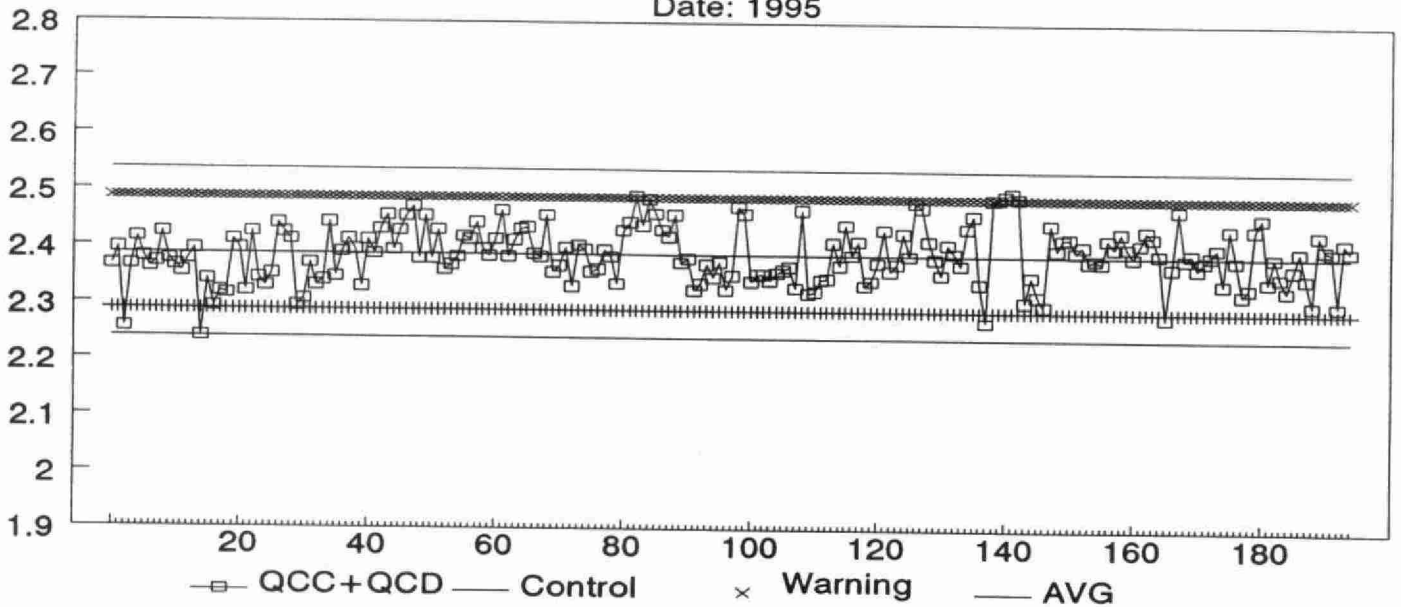
QC Difference Preconc. - Co

Date: 1995



QC Sum Preconc. - Co

Date: 1995



Copper (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 0.5 - 15,000 ug/L

Detection Limit (W): 0.5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0368

Control Samples:

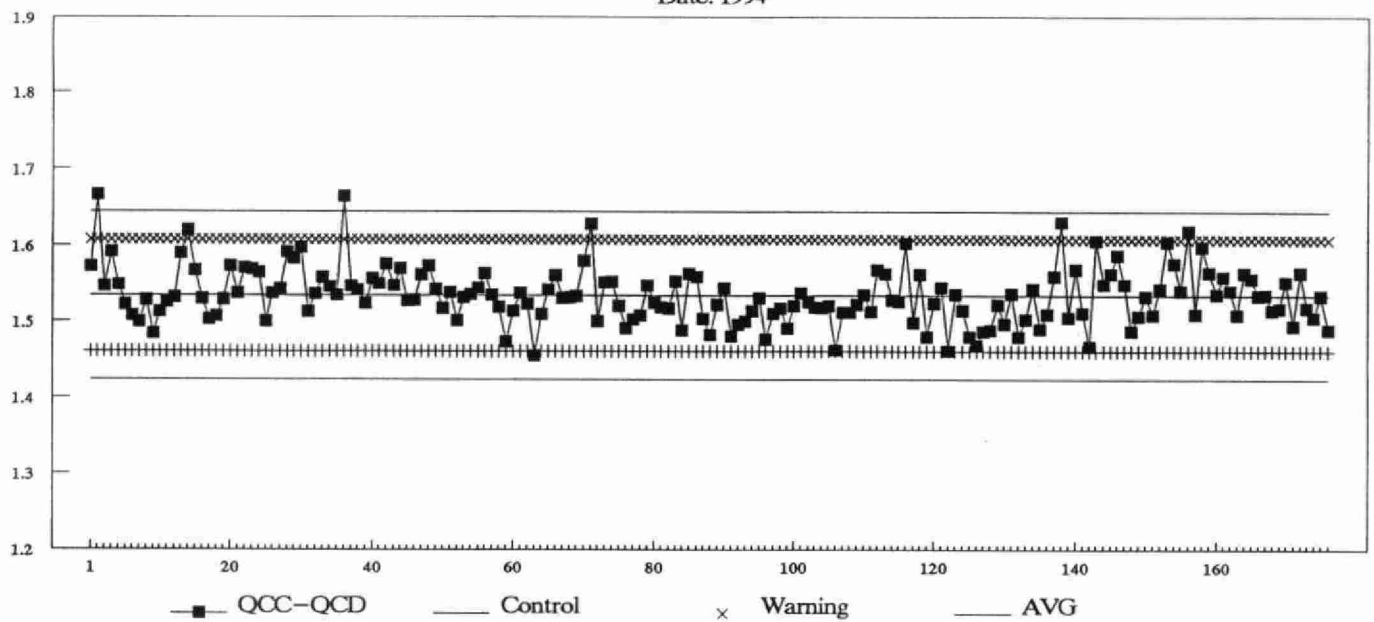
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	192	2.000	1.9220	-0.0780	0.0446
QCD:	192	0.400	0.3879	-0.0121	0.0112
QCC+QCD:	192	2.400	2.3099	-0.0901	0.0536
QCC-QCD:	192	1.600	1.5342	-0.0658	0.0368

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
160	0.5 - 50	7.71	0.555
15	50 - 500	233.5	3.05
n/a	500 - 5000	n/a	n/a

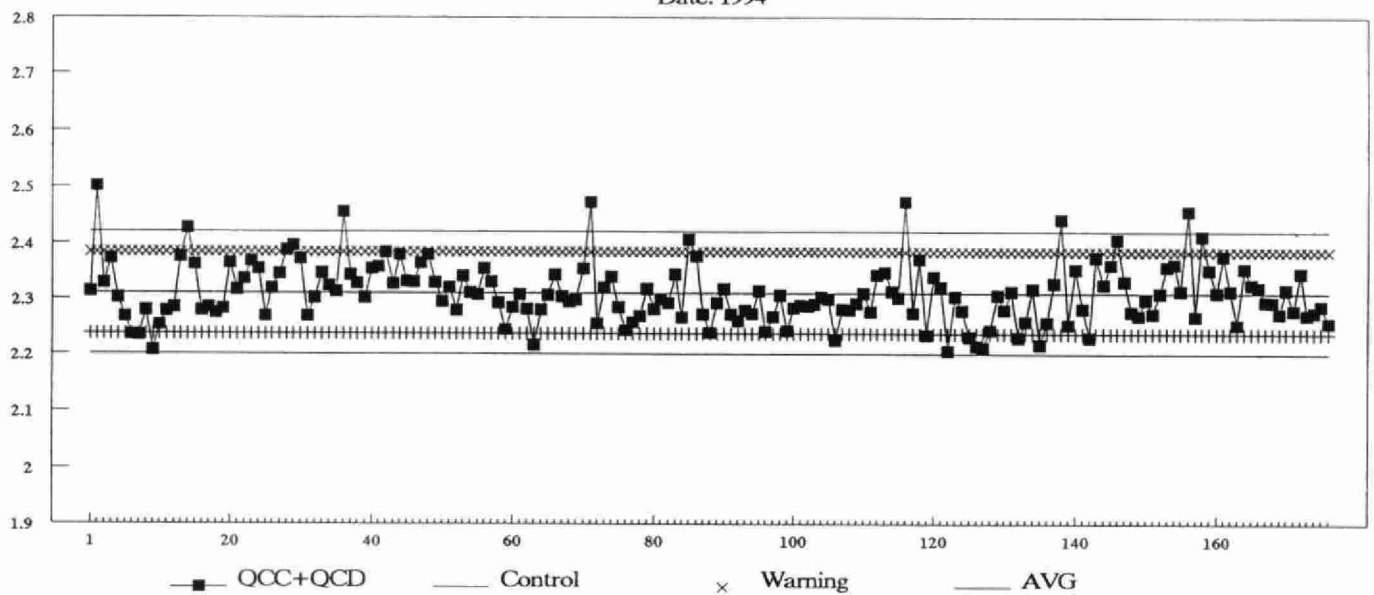
QC Difference Preconc. - Cu

Date: 1994



QC Sum Preconc. - Cu

Date: 1994



Copper (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 0.5 - 15,000 ug/L

Detection Limit (W): 0.5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0366

Control Samples:

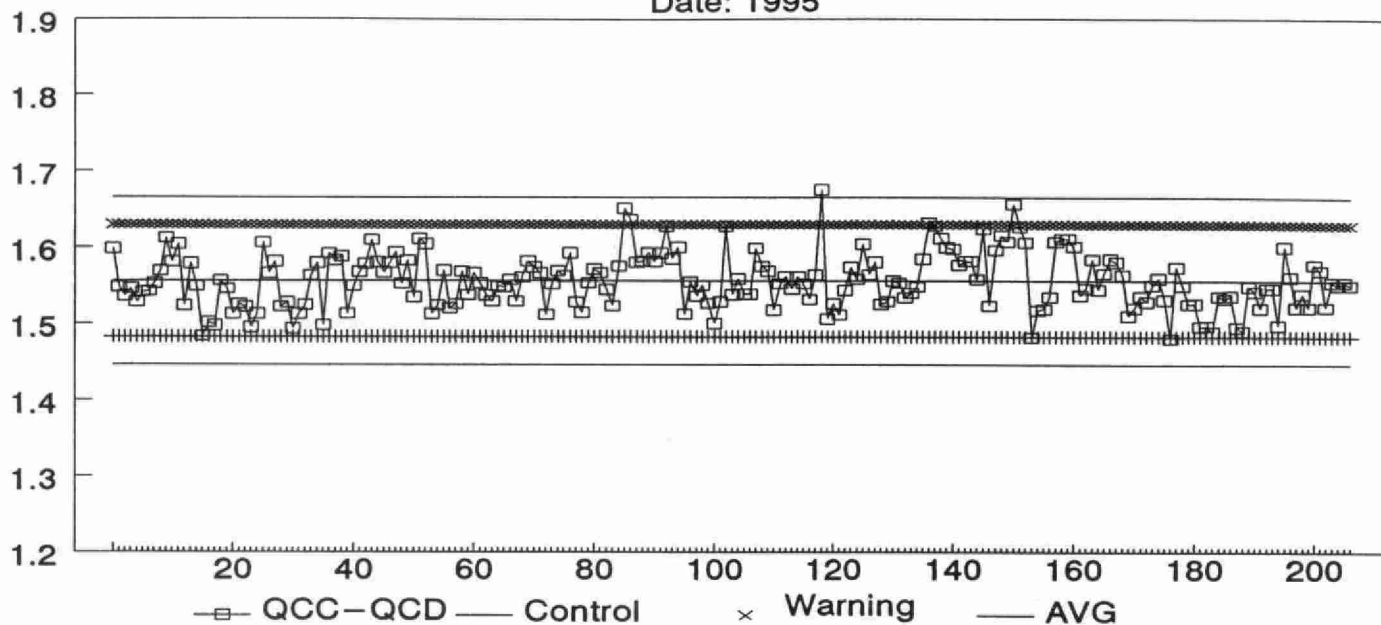
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	207	2.000	1.9457	-0.0543	0.0433
QCD:	207	0.400	0.3897	-0.0103	0.0098
QCC+QCD:	207	2.400	2.3354	-0.0646	0.0511
QCC-QCD:	207	1.600	1.5560	-0.0440	0.0366

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
152	0.5 - 50	8.67	0.460
24	50 - 500	180	2.8
n/a	500 - 5000	n/a	n/a

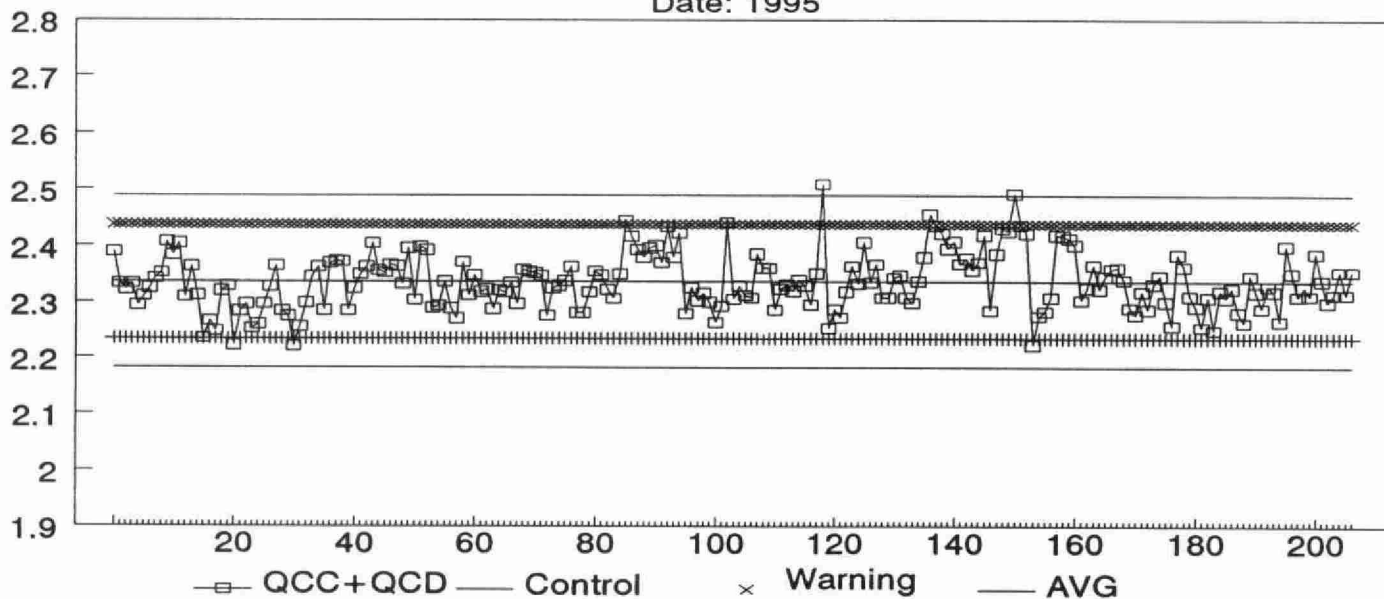
QC Difference Preconc. - Cu

Date: 1995



QC Sum Preconc. - Cu

Date: 1995



Iron (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 5 - 15,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.1806

Control Samples:

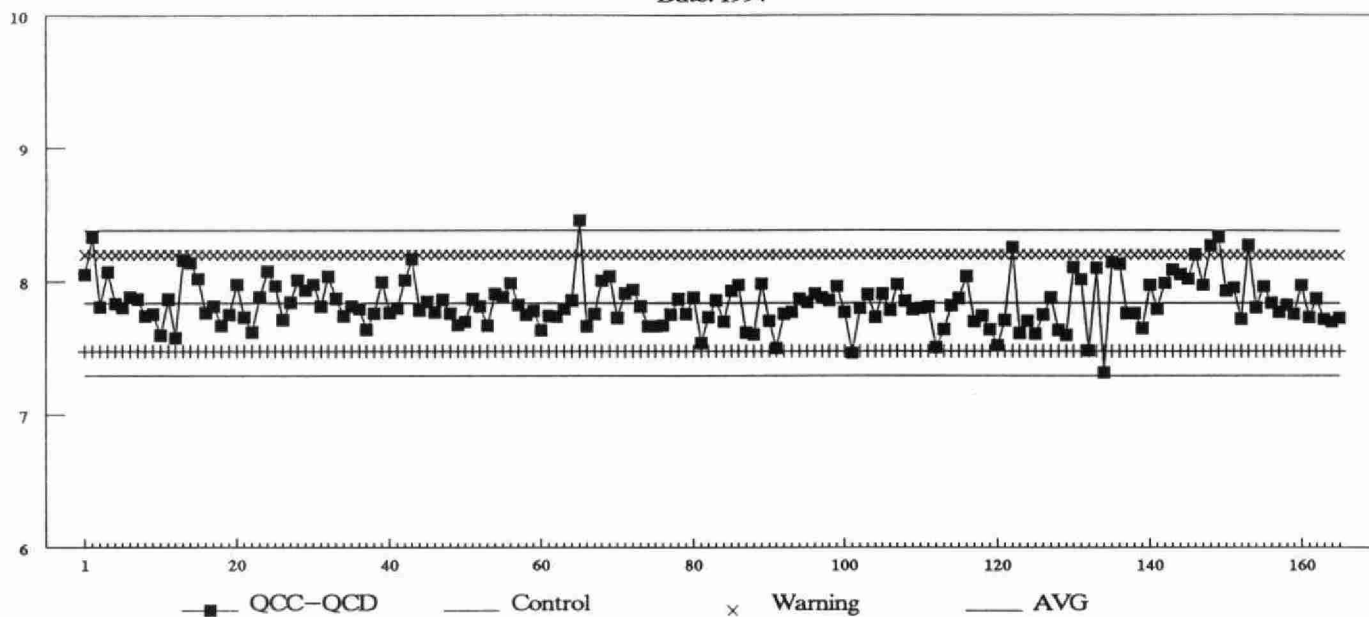
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	166	10.000	9.8251	-0.1749	0.2076
QCD:	166	2.000	1.9890	-0.0110	0.0710
QCC+QCD:	166	12.000	11.8141	-0.1859	0.2524
QCC-QCD:	166	8.000	7.8361	-0.1639	0.1806

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
113	5 - 500	132.6	6.07
44	500 - 5000	1252.0	42.10
6	5000 - 15000	8553.0	234.00

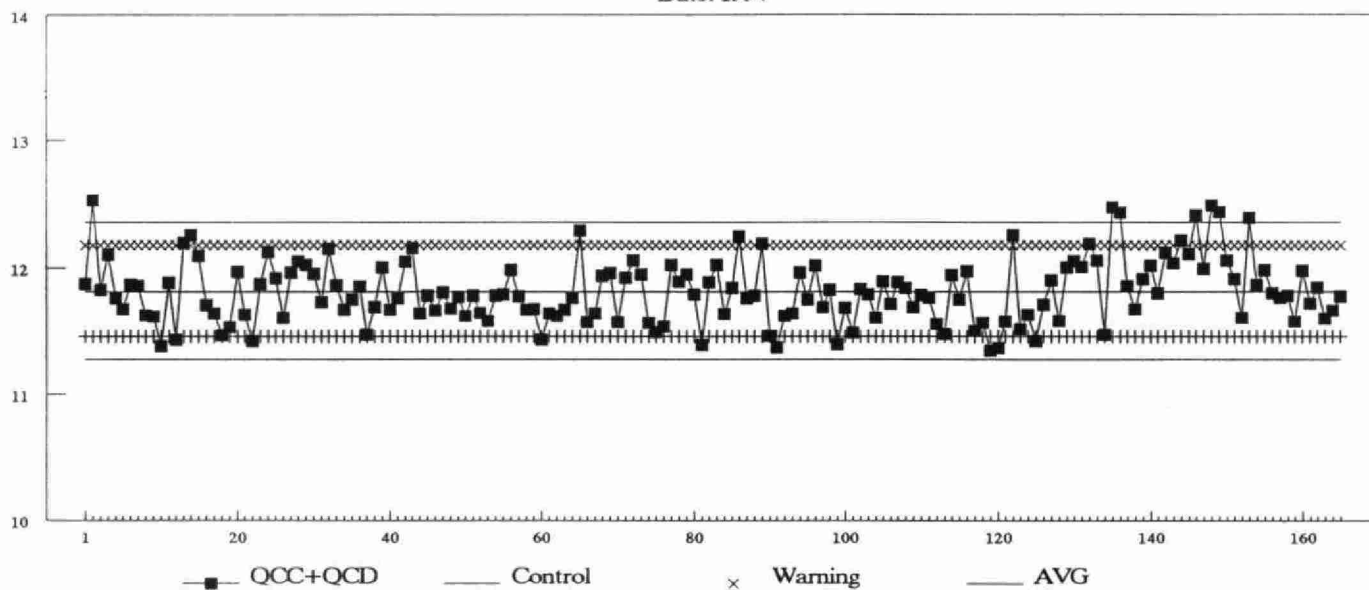
QC Difference Preconc. - Fe

Date: 1994



QC Sum Preconc. - Fe

Date: 1994



Iron (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 5 - 15,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.1486

Control Samples:

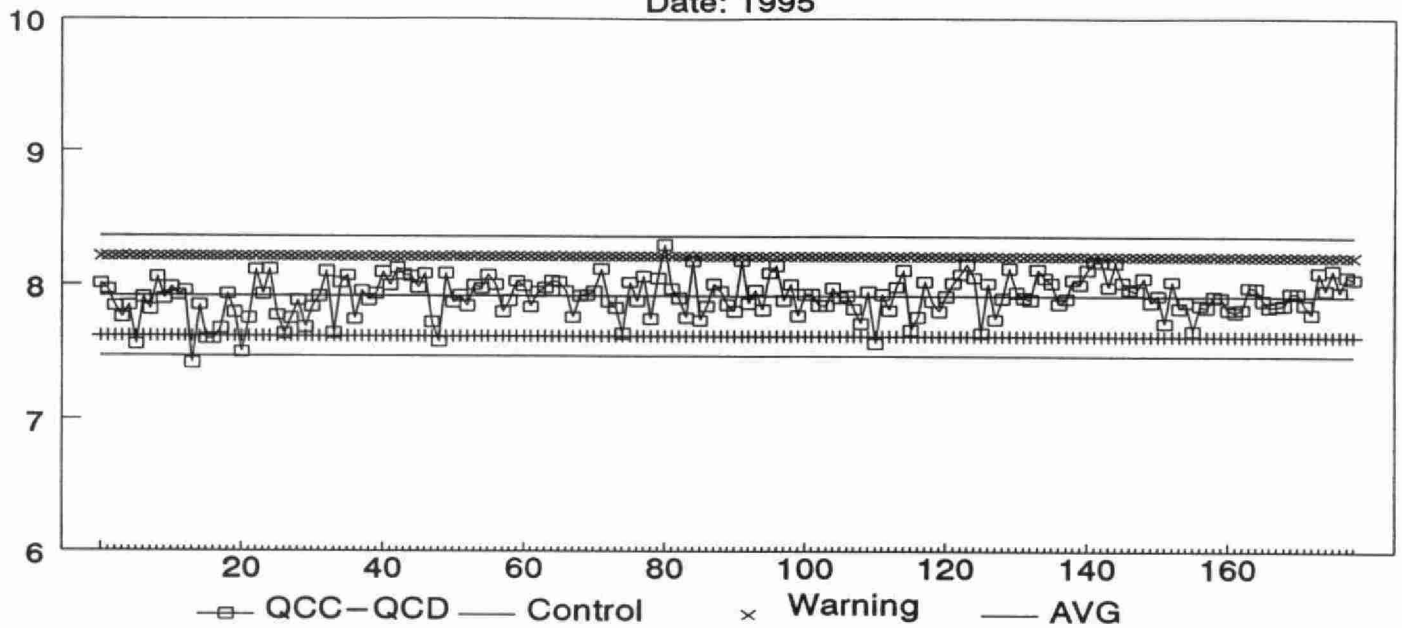
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	179	10.000	9.9018	-0.0982	0.1665
QCD:	179	2.000	1.9861	-0.0139	0.0539
QCC+QCD:	179	12.000	11.8878	-0.1122	0.1980
QCC-QCD:	179	8.000	7.9157	-0.0843	0.1486

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
119	5 - 500	149.0	5.00
39	500 - 5000	1503.0	24.00
5	5000 - 15000	10280.0	210.00

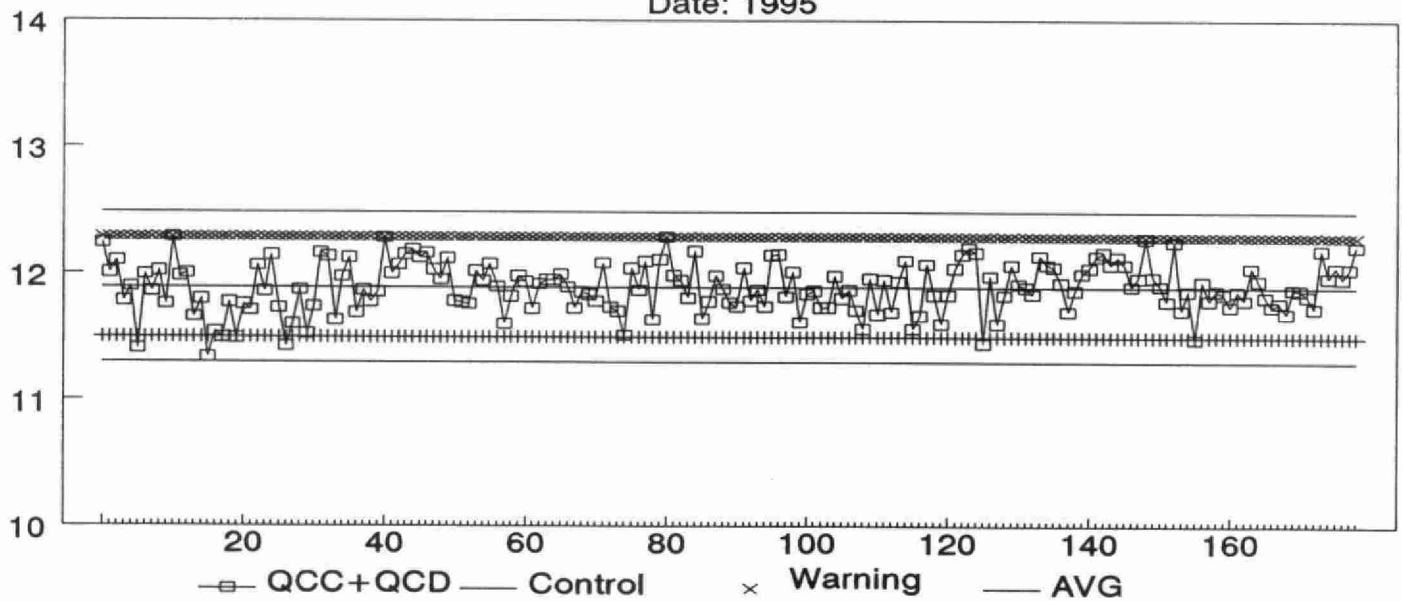
QC Difference Preconc. — Fe

Date: 1995



QC Sum Preconc. — Fe

Date: 1995



Lead (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 2 - 20,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0343

Control Samples:

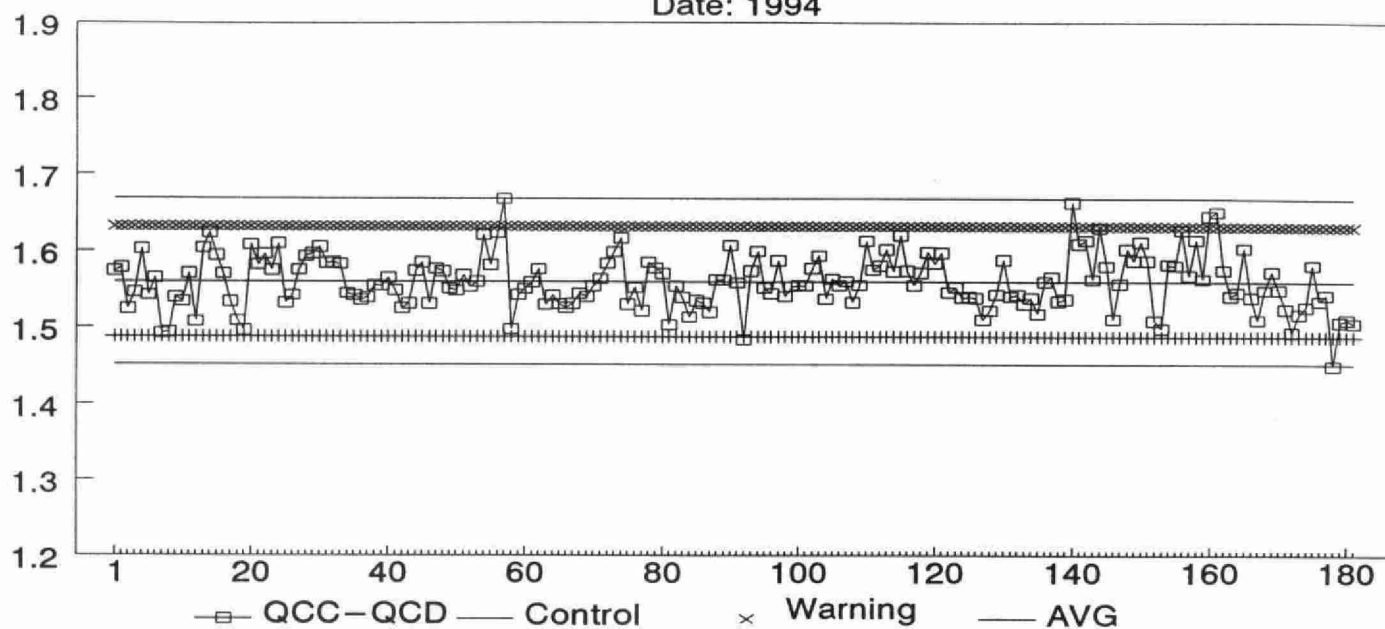
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	177	2.000	1.9534	-0.0466	0.0396
QCD:	177	0.400	0.3929	-0.0071	0.0159
QCC+QCD:	177	2.400	2.3463	-0.0537	0.0496
QCC-QCD:	177	1.600	1.5604	-0.0396	0.0343

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
183	2 - 200	4.69	1.22
n/a	200 - 2000	n/a	n/a
n/a	2000 - 20000	n/a	n/a

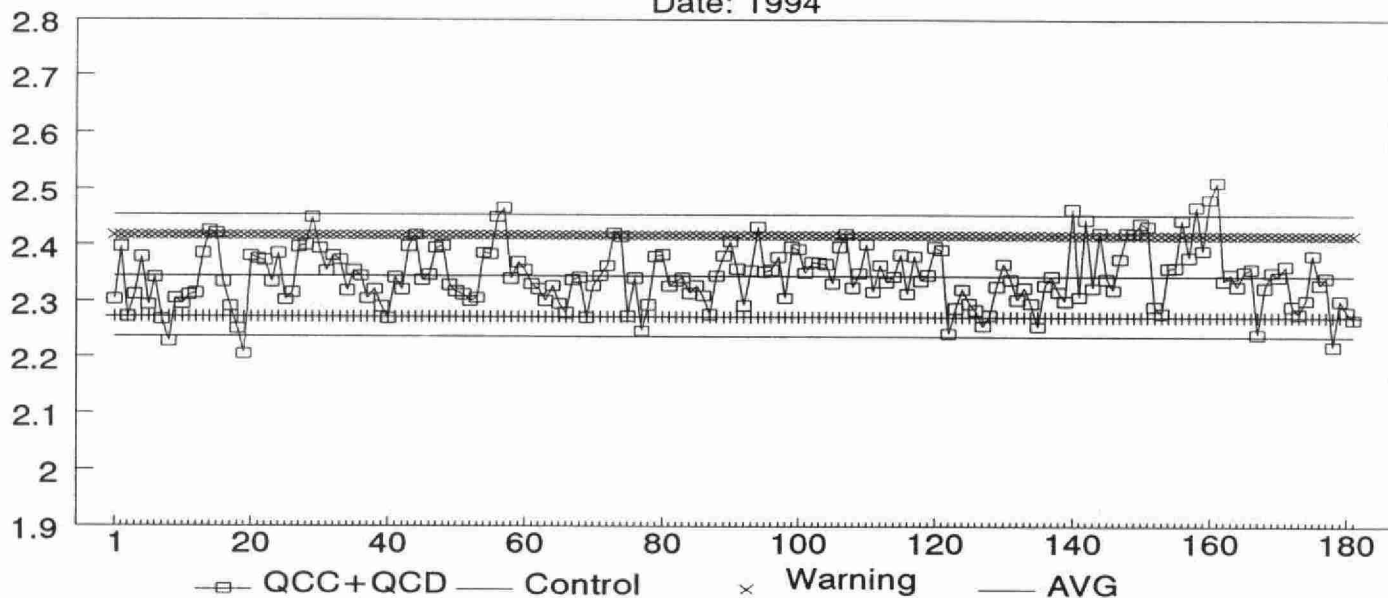
QC Difference Preconc. - Pb

Date: 1994



QC Sum Preconc. - Pb

Date: 1994



Lead (Total) - Preconcentrated**Quality Control Data from 950101 to 951231**

Analytical Range: 2 - 20,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0424

Control Samples:

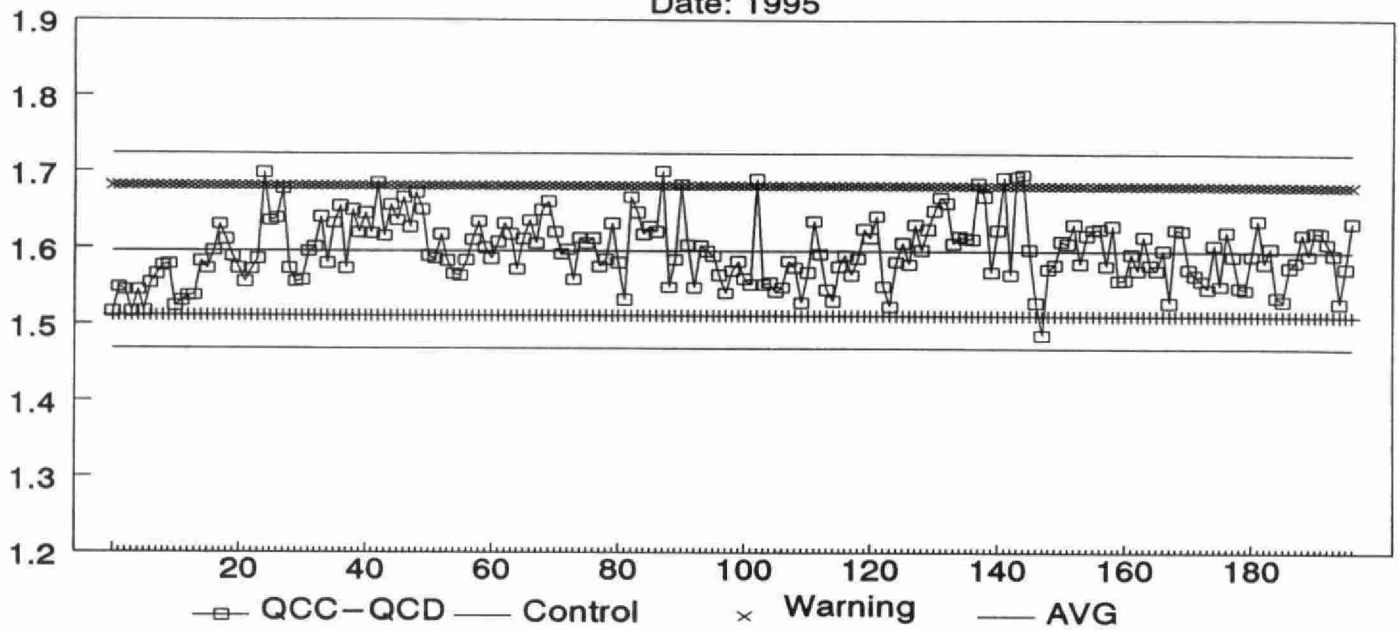
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	197	2.000	1.9900	-0.0100	0.0498
QCD:	197	0.400	0.3941	-0.0059	0.0146
QCC+QCD:	197	2.400	2.3841	-0.0159	0.0600
QCC-QCD:	197	1.600	1.5959	-0.0041	0.0424

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
182	2 - 200	6.10	1.10
n/a	200 - 2000	n/a	n/a
n/a	2000 - 20000	n/a	n/a

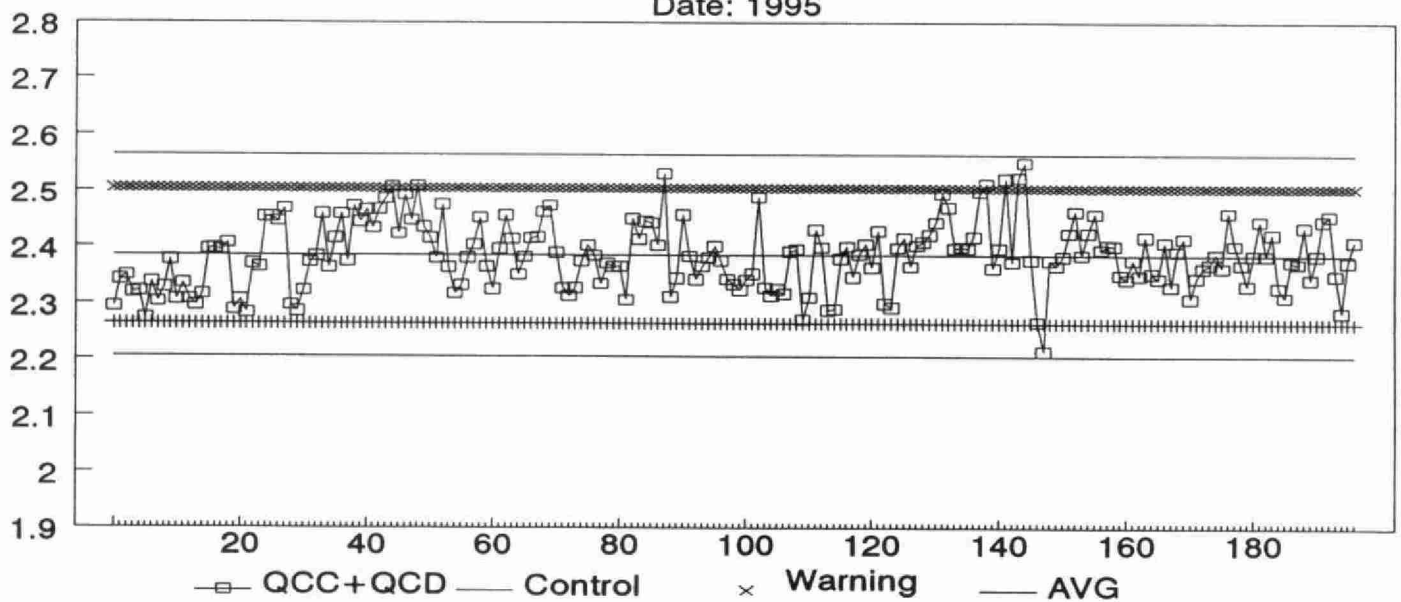
QC Difference Preconc. - Pb

Date: 1995



QC Sum Preconc. - Pb

Date: 1995



Manganese (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 1 - 15,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0330

Control Samples:

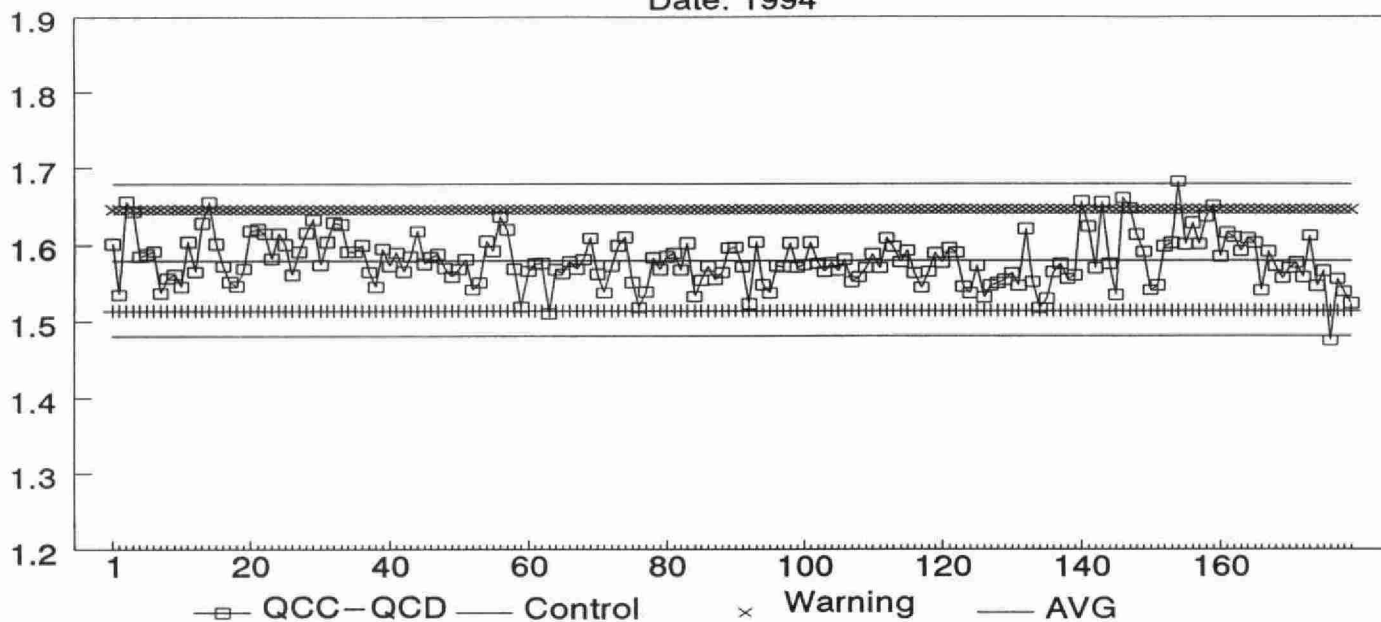
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	180	2.000	1.9726	-0.0274	0.0378
QCD:	180	0.400	0.3928	-0.0072	0.0087
QCC+QCD:	180	2.400	2.3654	-0.0346	0.0439
QCC-QCD:	180	1.600	1.5798	-0.0202	0.0330

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
134	1 - 100	26.80	0.93
46	100 - 1000	259.00	4.17
n/a	1000 - 10000	n/a	n/a

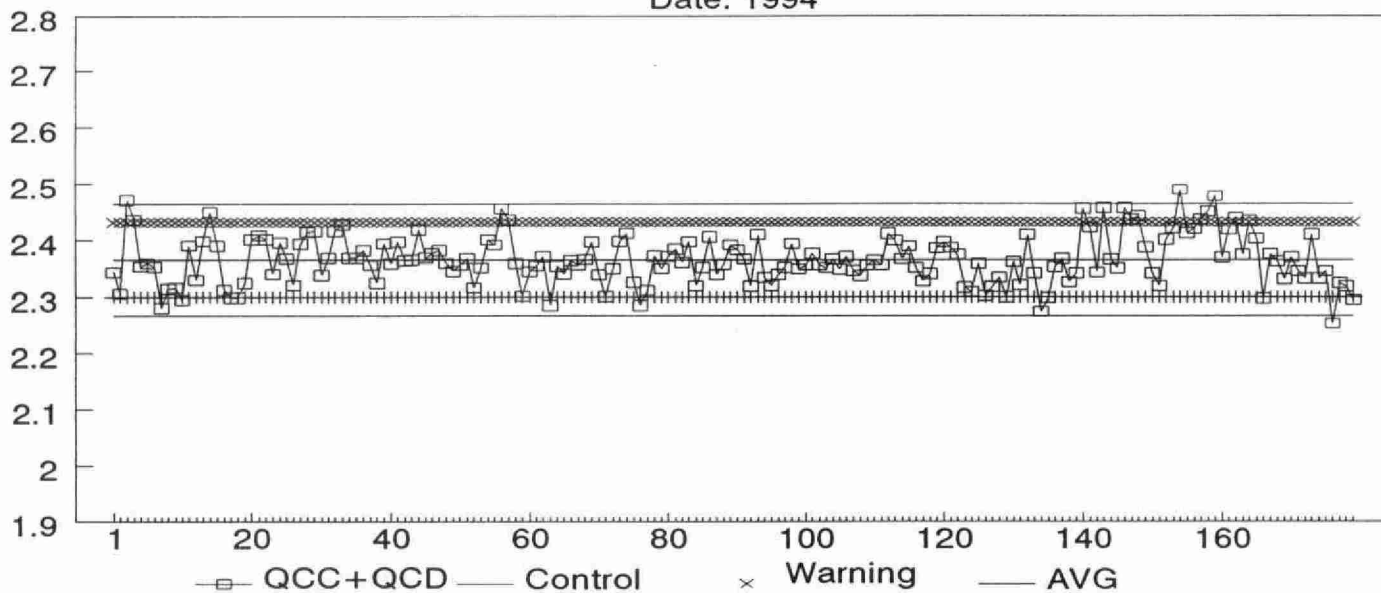
QC Difference Preconc. — Mn

Date: 1994



QC Sum Preconc. — Mn

Date: 1994



Manganese (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 1 - 15,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0427

Control Samples:

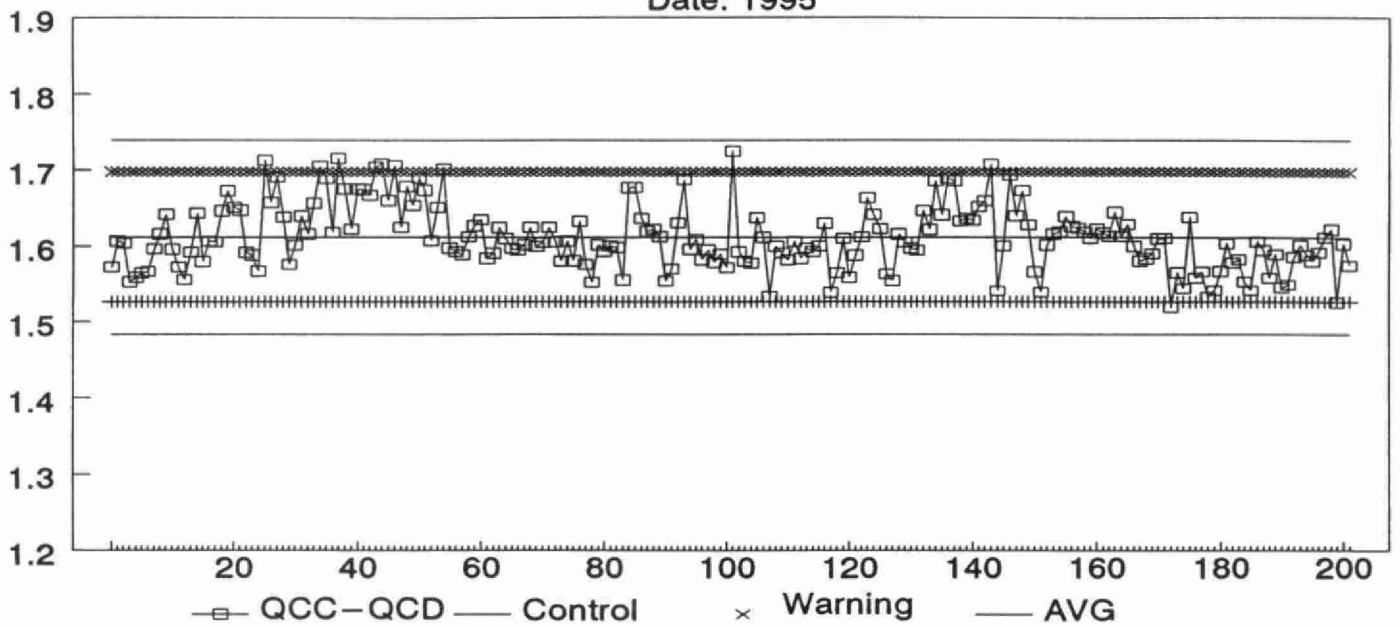
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	202	2.000	2.0085	0.0085	0.0505
QCD:	202	0.400	0.3969	-0.0031	0.0096
QCC+QCD:	202	2.400	2.4054	0.0054	0.0589
QCC-QCD:	202	1.600	1.6115	0.0115	0.0427

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
141	1 - 100	26.40	0.66
31	100 - 1000	268.00	3.3
n/a	1000 - 10000	n/a	n/a

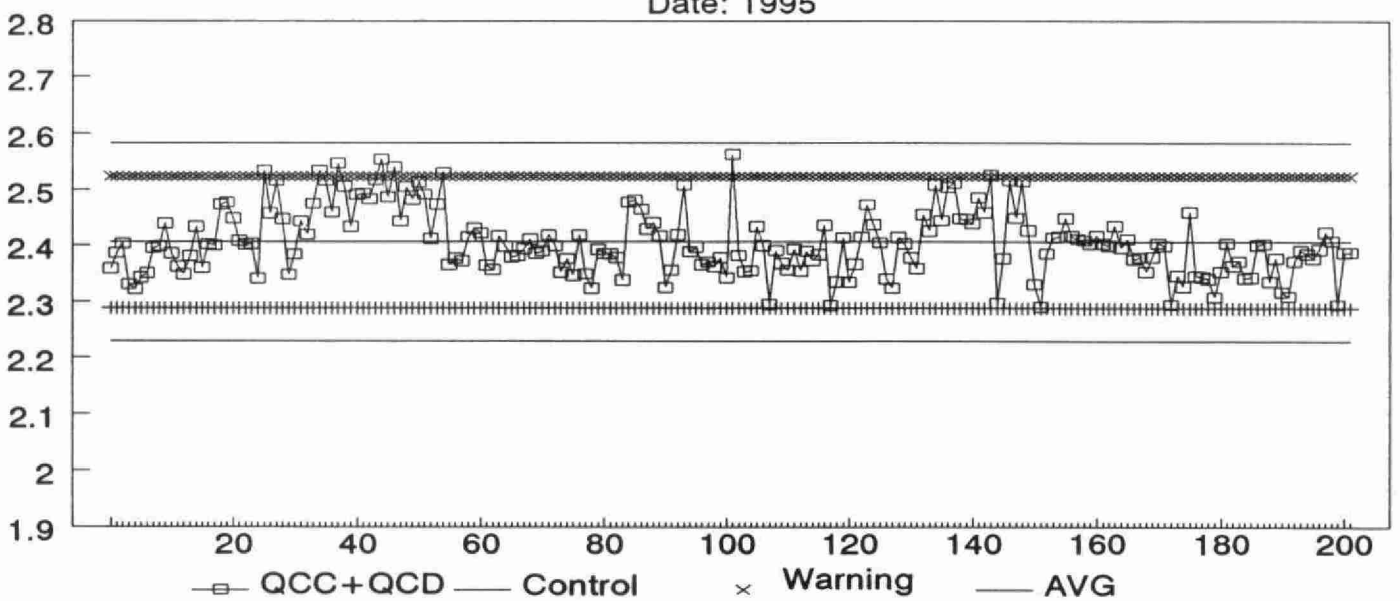
QC Difference Preconc. - Mn

Date: 1995



QC Sum Preconc. - Mn

Date: 1995



Molybdenum (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 0.2 - 20,000 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0439

Control Samples:

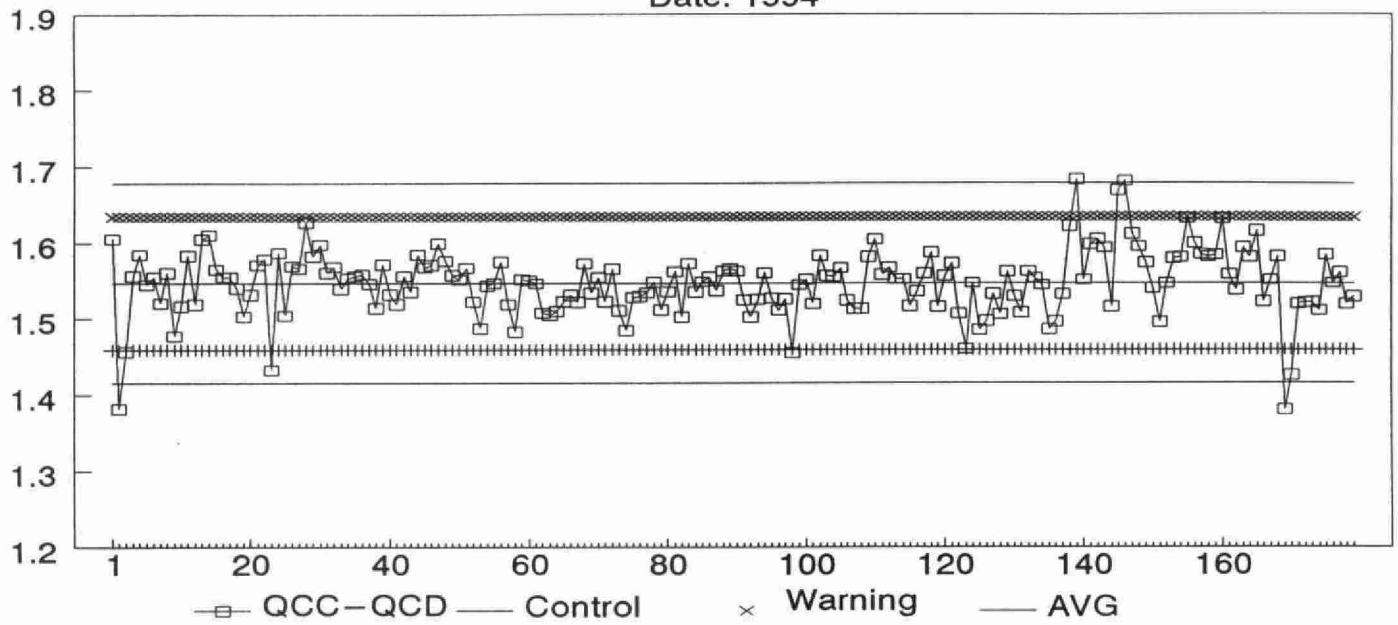
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	180	2.000	1.9346	-0.0654	0.0495
QCD:	180	0.400	0.3880	-0.0120	0.0100
QCC+QCD:	180	2.400	2.3226	-0.0774	0.0564
QCC-QCD:	180	1.600	1.5466	-0.0534	0.0439

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
182	0.2 - 20	0.86	0.20
n/a	20 - 200	n/a	n/a
n/a	200 - 2000	n/a	n/a

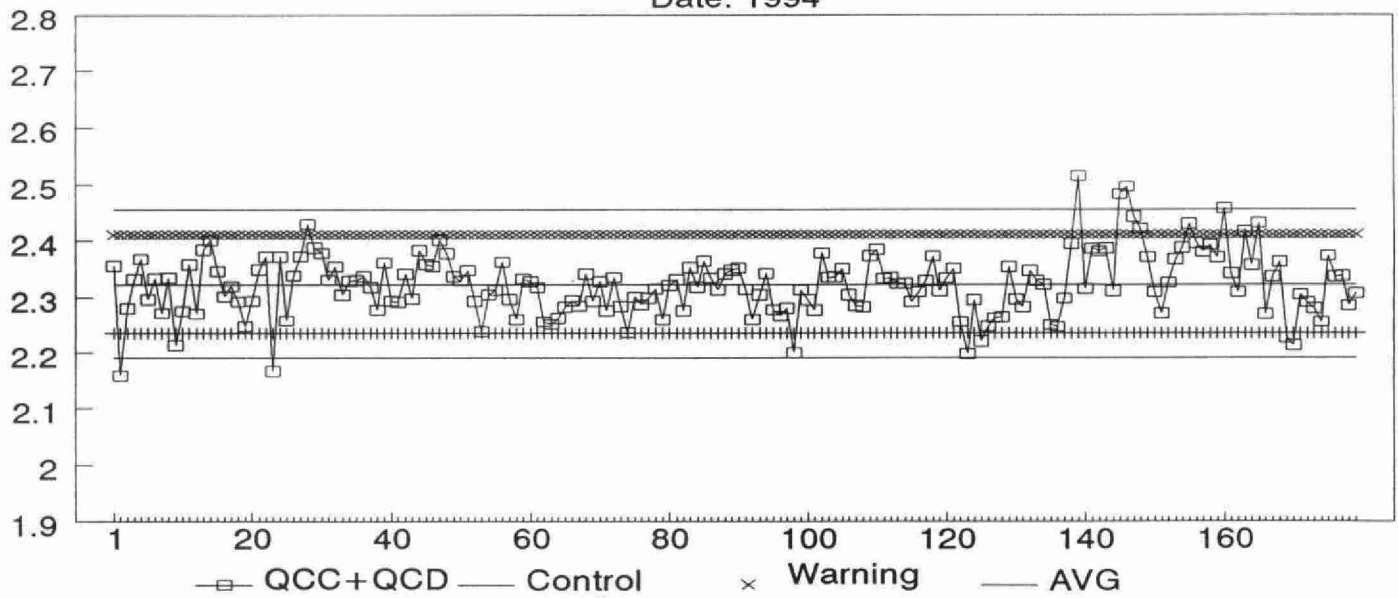
QC Difference Preconc. — Mo

Date: 1994



QC Sum Preconc. — Mo

Date: 1994



Molybdenum (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 0.2 - 20,000 ug/L

Detection Limit (W): 0.2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0419

Control Samples:

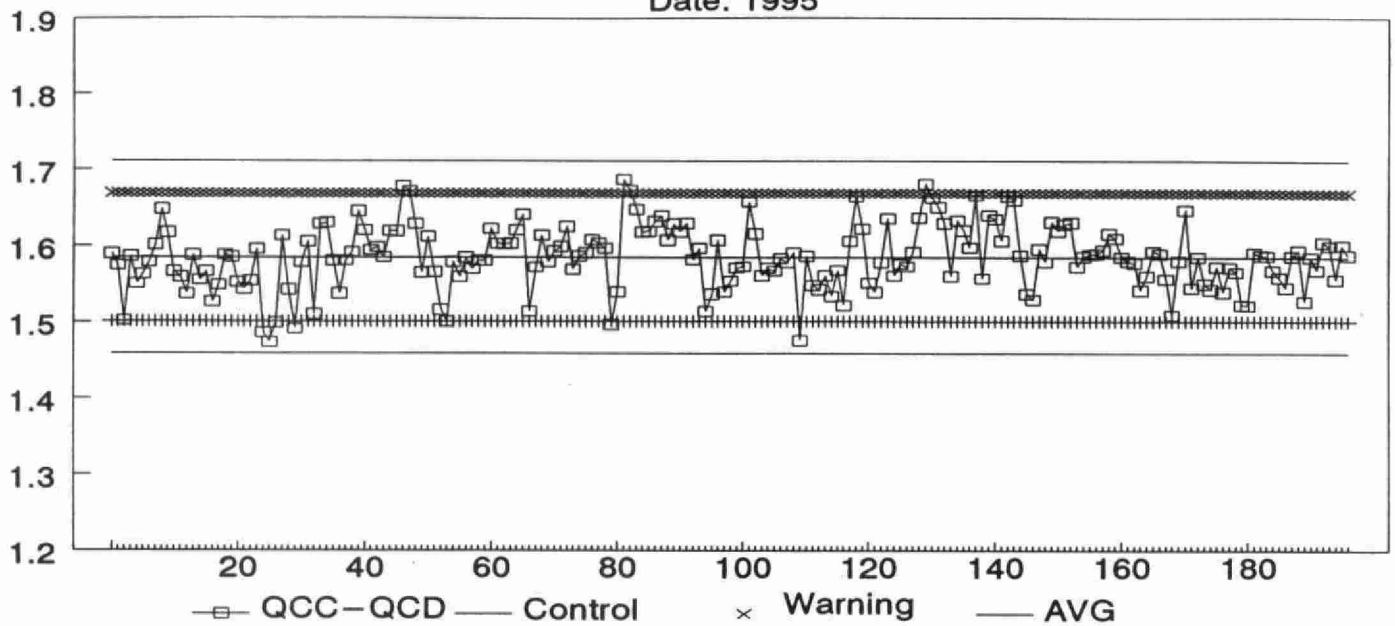
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	197	2.000	1.9741	-0.0259	0.0492
QCD:	197	0.400	0.3894	-0.0106	0.0106
QCC+QCD:	197	2.400	2.3635	-0.0365	0.0576
QCC-QCD:	197	1.600	1.5847	-0.0153	0.0419

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
173	0.2 - 20	0.79	0.15
n/a	20 - 200	n/a	n/a
n/a	200 - 2000	n/a	n/a

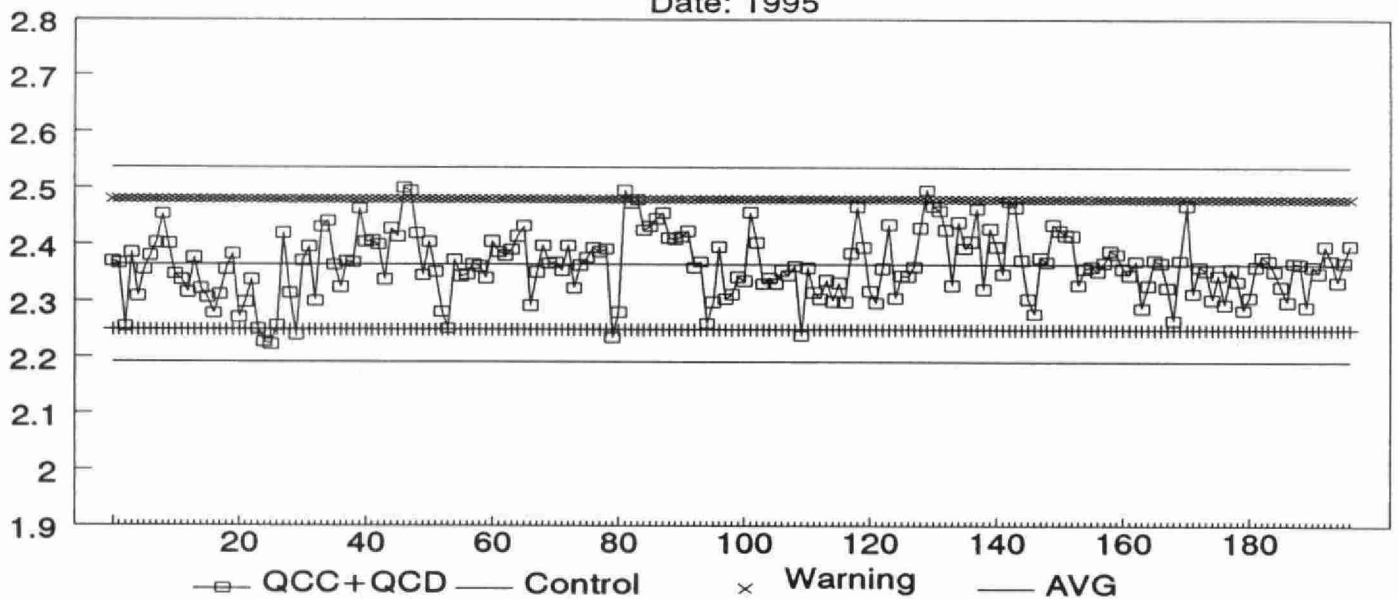
QC Difference Preconc. – Mo

Date: 1995



QC Sum Preconc. – Mo

Date: 1995



Nickel (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 1 - 20,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0375

Control Samples:

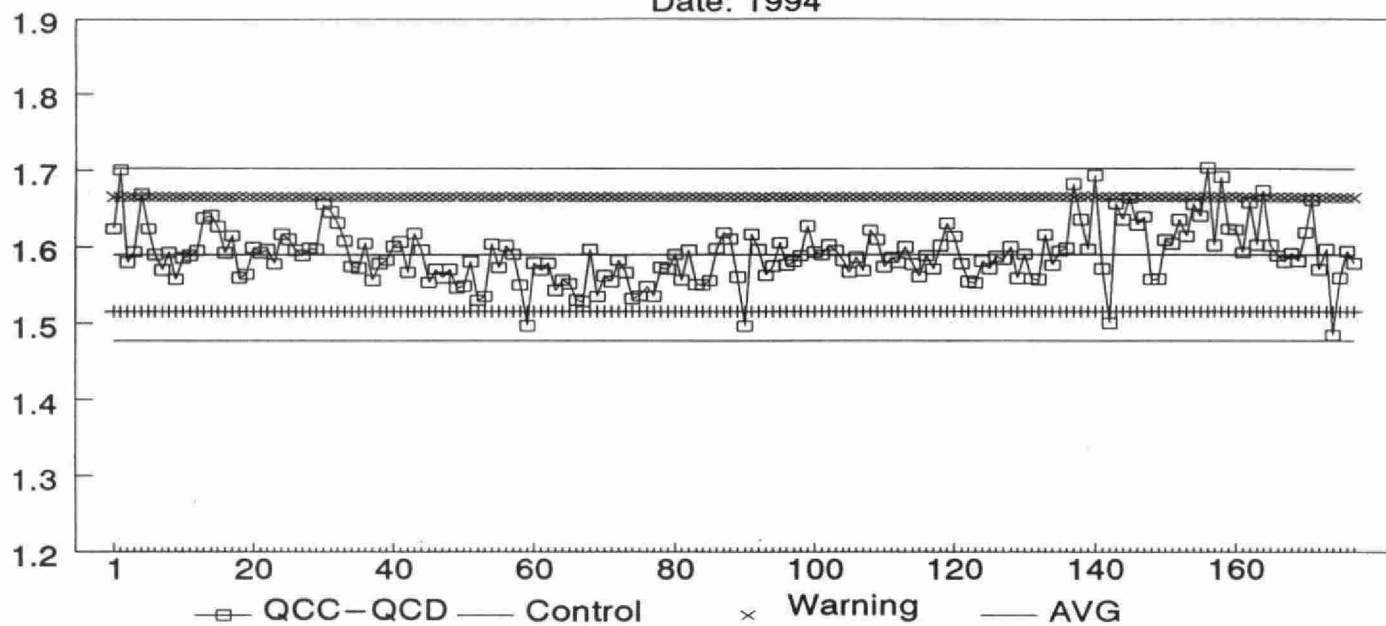
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	178	2.000	1.9869	-0.0131	0.0441
QCD:	178	0.400	0.3966	-0.0034	0.0103
QCC+QCD:	178	2.400	2.3835	-0.0165	0.0519
QCC-QCD:	178	1.600	1.5902	-0.0098	0.0375

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
170	1 - 100	3.68	0.49
5	100 - 1000	432	19
n/a	1000 - 10000	n/a	n/a

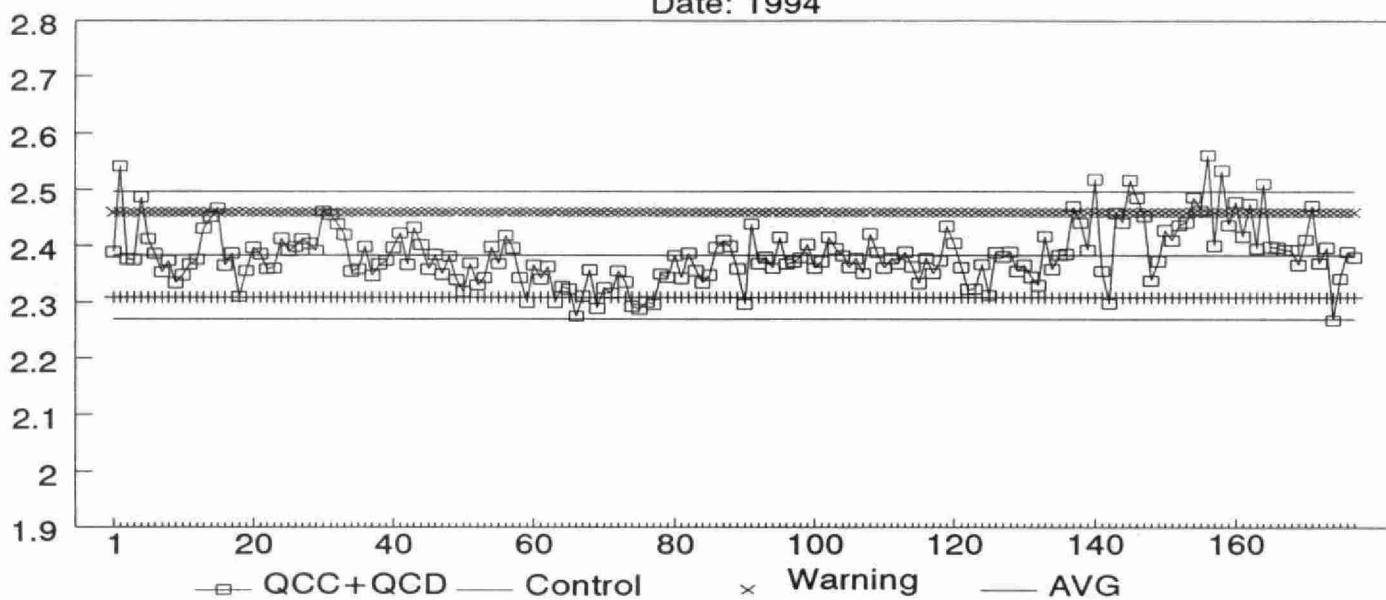
QC Difference Preconc. - Ni

Date: 1994



QC Sum Preconc. - Ni

Date: 1994



Nickel (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 1 - 20,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0332

Control Samples:

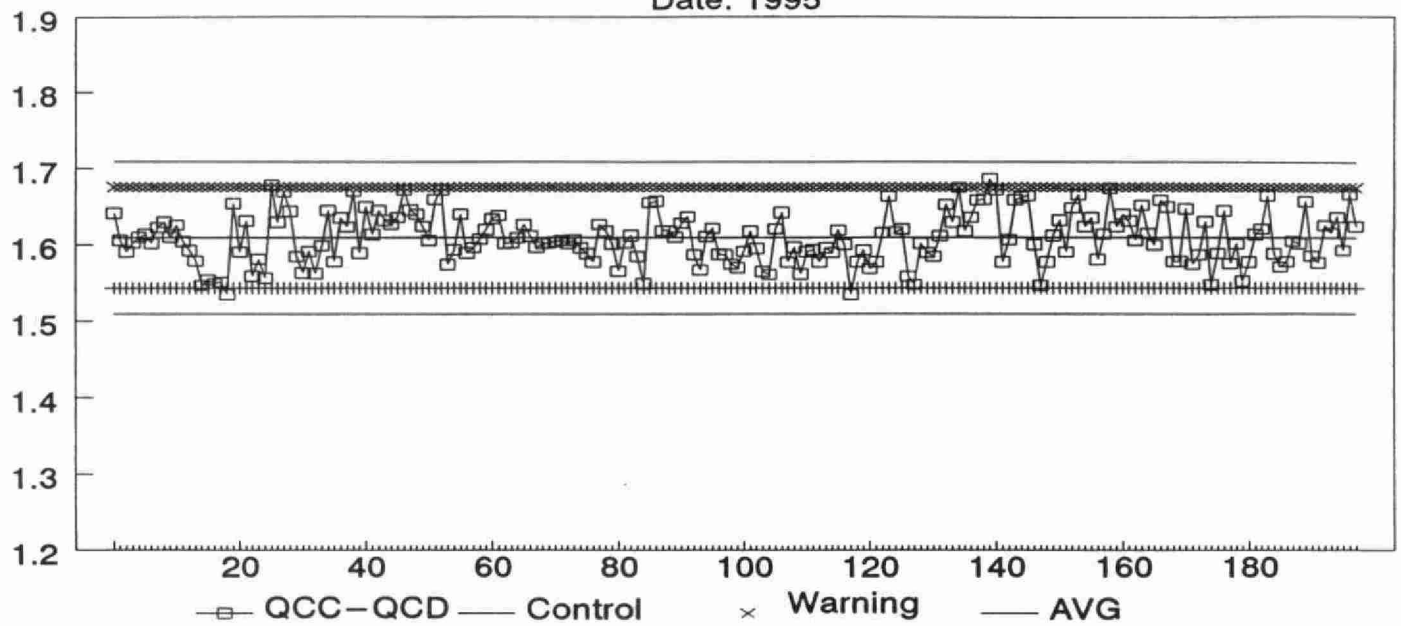
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	198	2.000	2.0097	0.0097	0.0388
QCD:	198	0.400	0.4005	0.0005	0.0106
QCC+QCD:	198	2.400	2.4102	0.0102	0.0462
QCC-QCD:	198	1.600	1.6091	0.0091	0.0332

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
160	1 - 100	5.60	0.36
10	100 - 1000	303	5.4
n/a	1000 - 10000	n/a	n/a

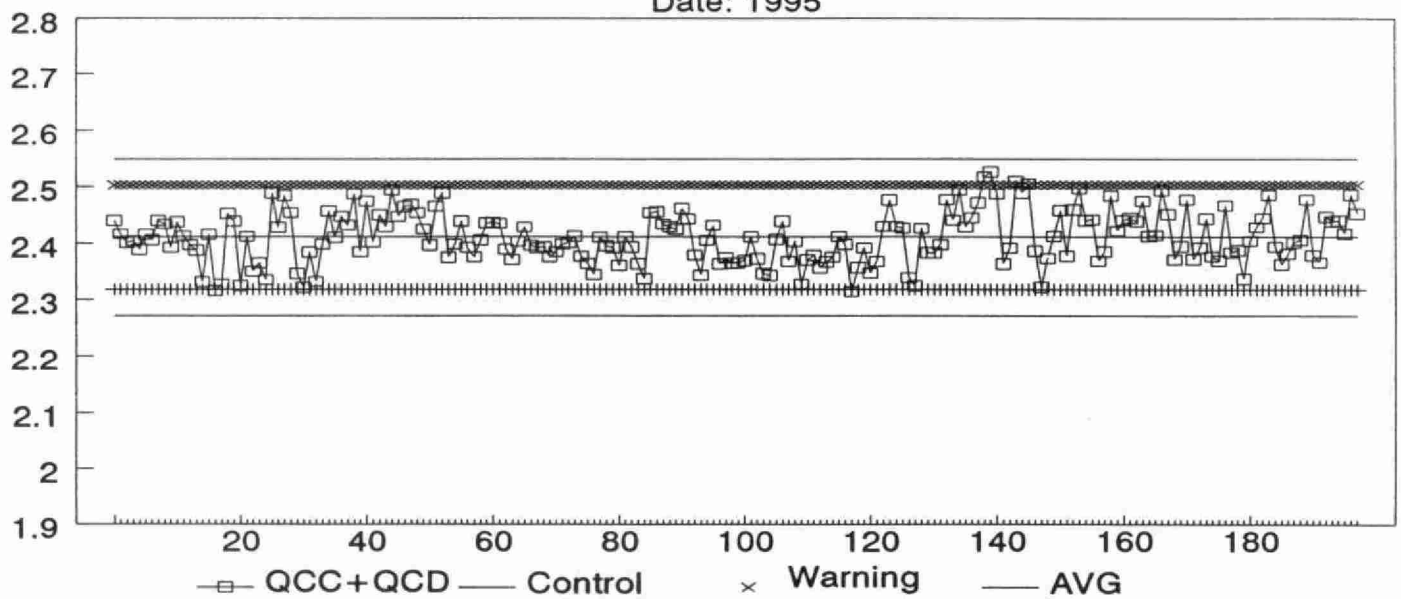
QC Difference Preconc. - Ni

Date: 1995



QC Sum Preconc. - Ni

Date: 1995



Silver (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 0.5 - 15,000 ug/L

Detection Limit (W): 0.5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0330

Control Samples:

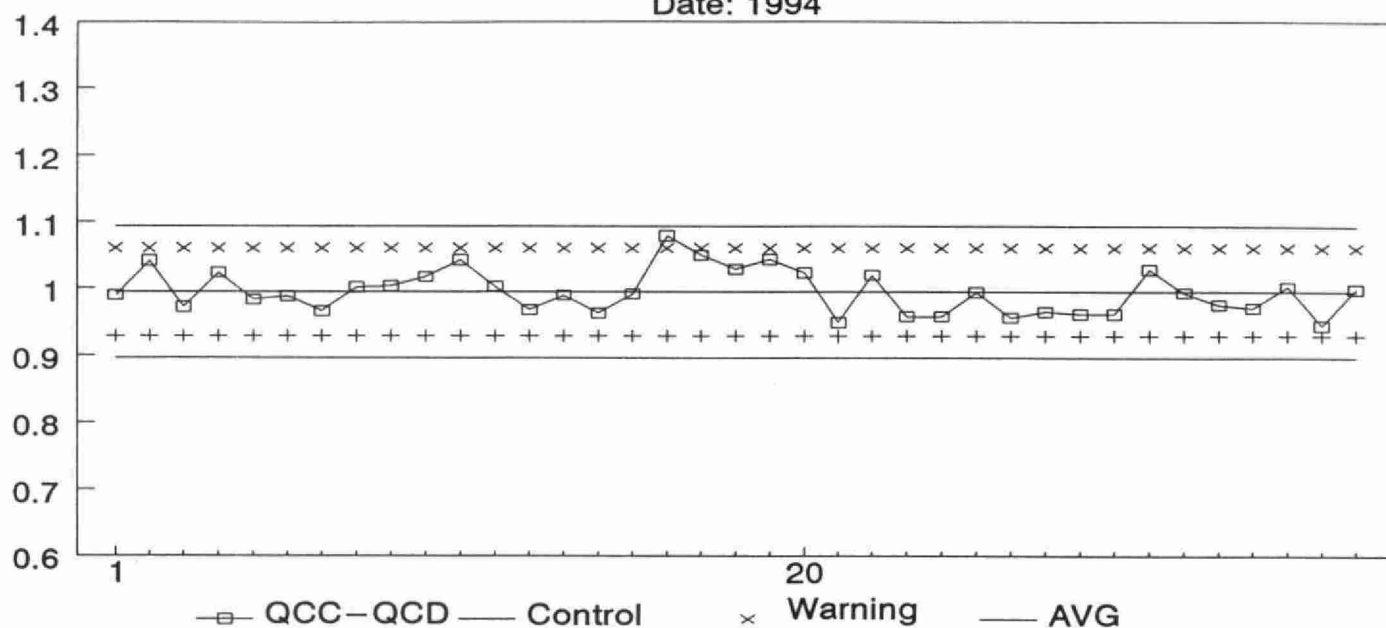
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	37	2.000	1.9965	-0.0035	0.0599
QCD:	37	1.000	1.0019	0.0019	0.0423
QCC+QCD:	37	3.000	2.9983	-0.0017	0.0983
QCC-QCD:	37	1.000	0.9946	-0.0054	0.0330

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
184	0.5 - 50	0.01	0.29
n/a	50 - 500	n/a	n/a
n/a	500 - 5000	n/a	n/a

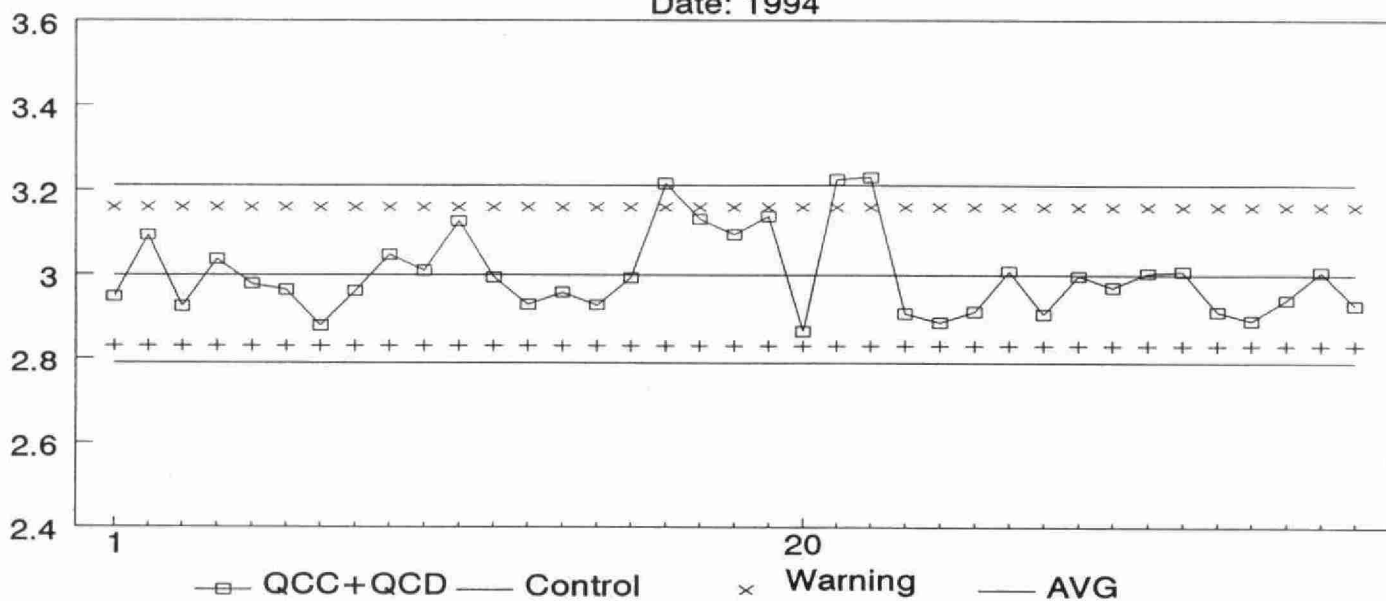
QC Difference Preconc. - Ag

Date: 1994



QC Sum Preconc. - Ag

Date: 1994



Silver (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 0.5 - 15,000 ug/L

Detection Limit (W): 0.5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0268

Control Samples:

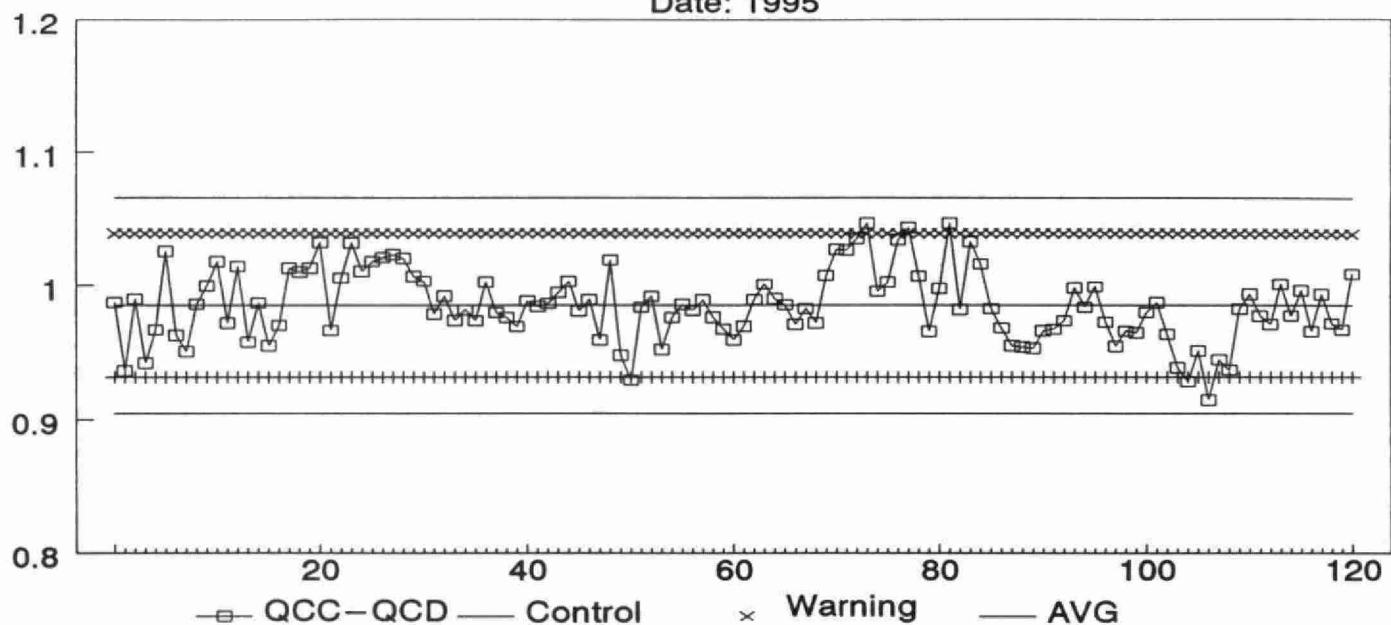
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	121	2.000	1.9725	-0.0275	0.0462
QCD:	121	1.000	0.9873	-0.0127	0.0233
QCC+QCD:	121	3.000	2.9598	-0.0402	0.0681
QCC-QCD:	121	1.000	0.9853	-0.0147	0.0268

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
163	0.5 - 50	0.01	0.16
n/a	50 - 500	n/a	n/a
n/a	500 - 5000	n/a	n/a

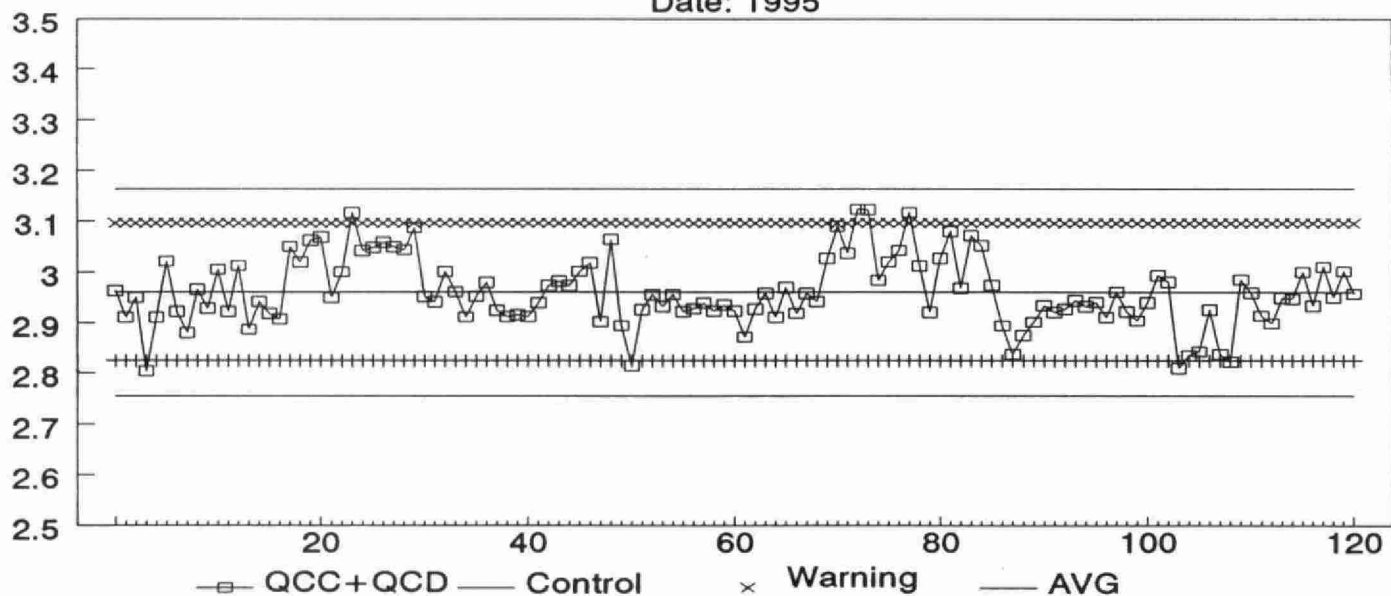
QC Difference Preconc. – Ag

Date: 1995



QC Sum Preconc. – Ag

Date: 1995



Strontium (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 1 - 10,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0234

Control Samples:

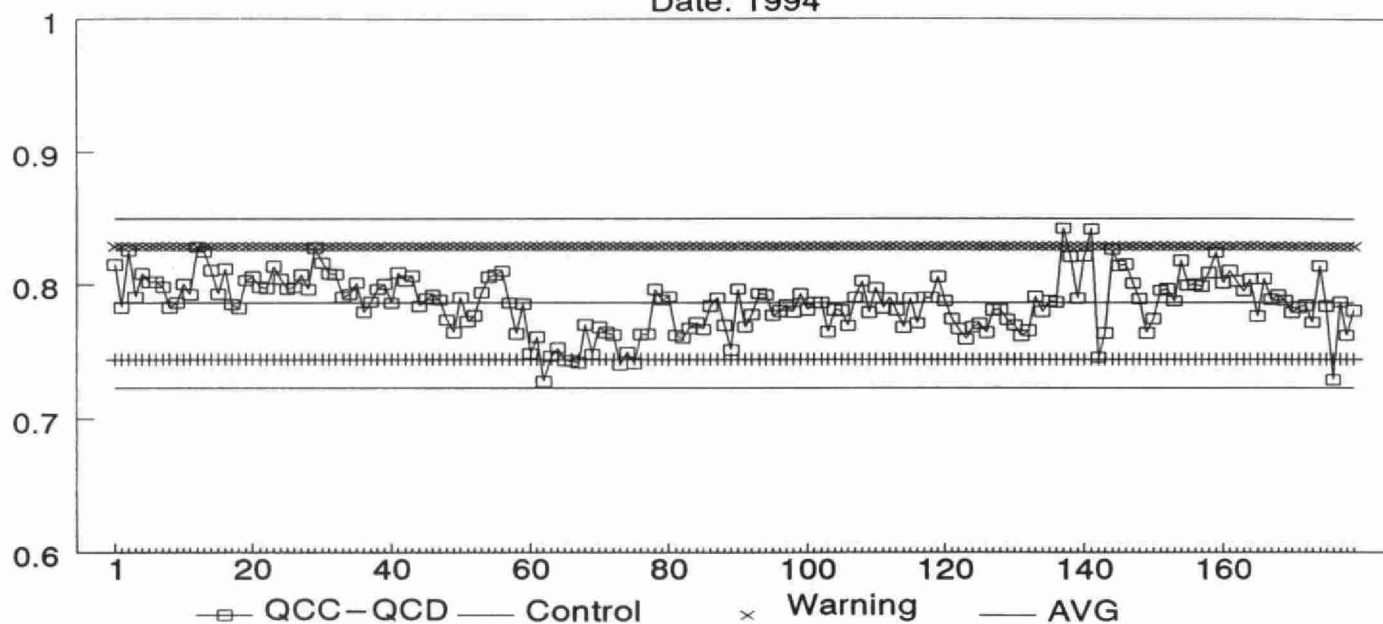
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	180	1.000	0.9803	-0.0197	0.0261
QCD:	180	0.200	0.1944	-0.0056	0.0050
QCC+QCD:	180	1.200	1.1747	-0.0253	0.0293
QCC-QCD:	180	0.800	0.7858	-0.0142	0.0234

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
140	1 - 100	36.24	0.93
38	100 - 1000	333	10.2
5	1000 - 10000	1550.00	10.5

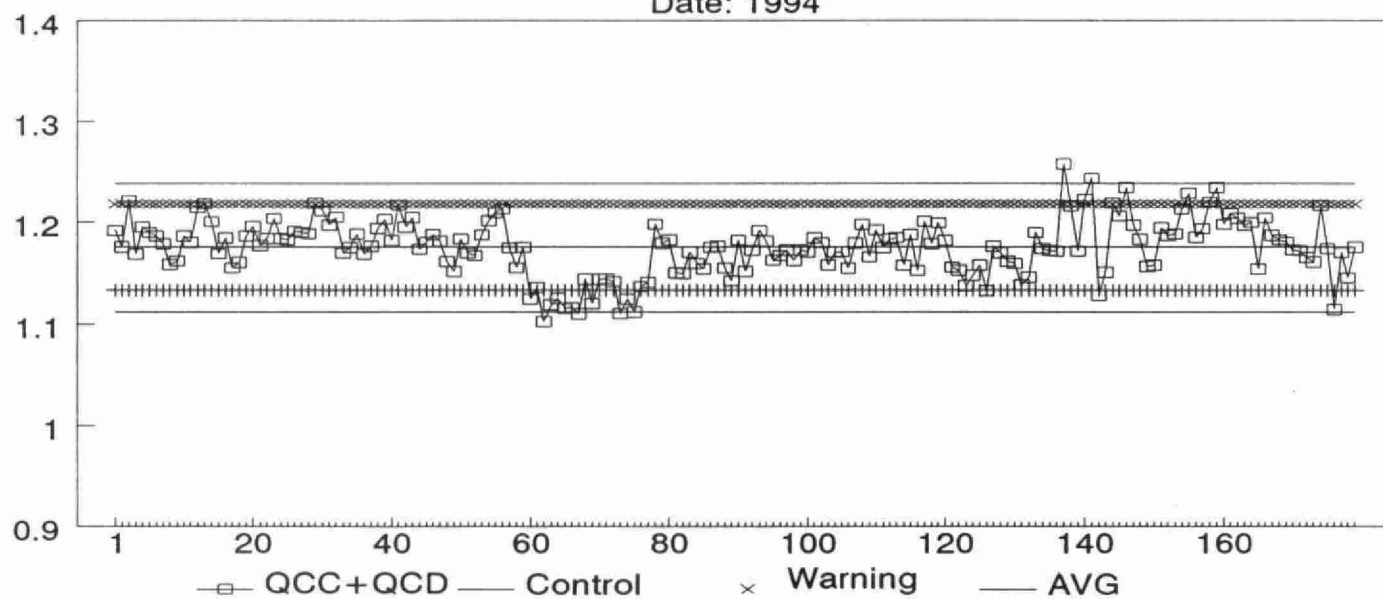
QC Difference Preconc. – Sr

Date: 1994



QC Sum Preconc. – Sr

Date: 1994



Strontium (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 1 - 10,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0200

Control Samples:

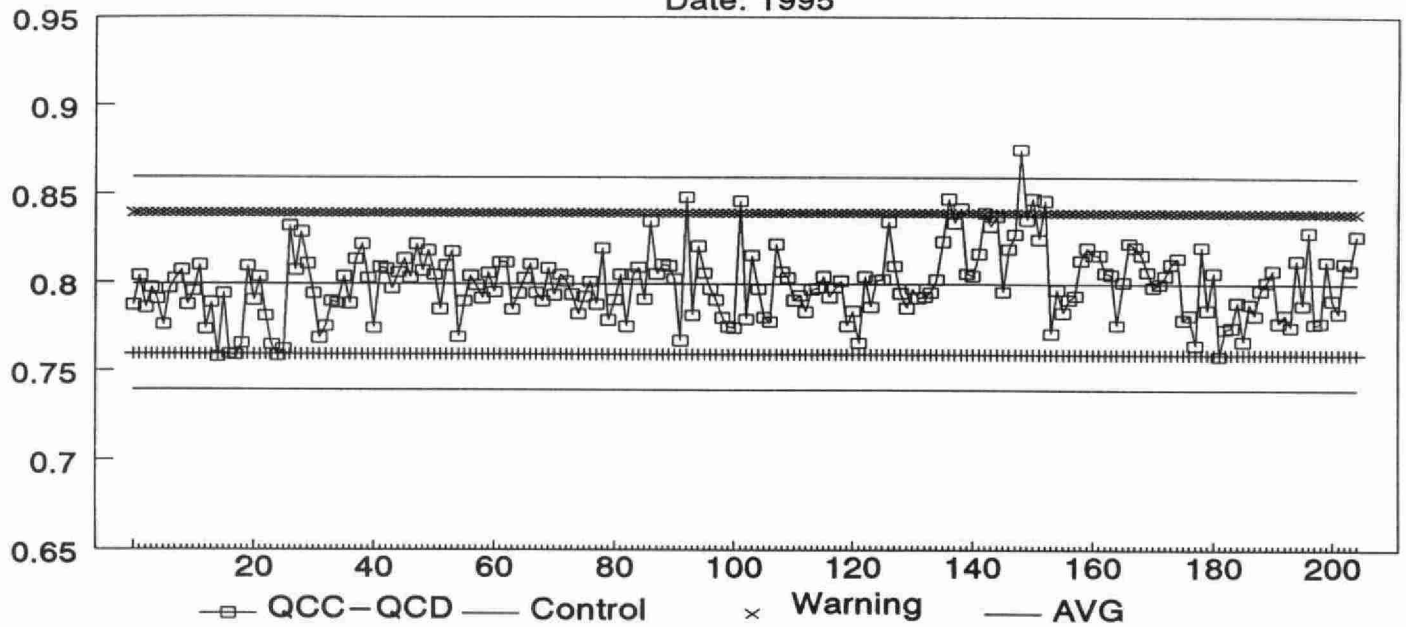
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	205	1.000	0.9951	-0.0049	0.0233
QCD:	205	0.200	0.1957	-0.0043	0.0046
QCC+QCD:	205	1.200	1.1907	-0.0093	0.0269
QCC-QCD:	205	0.800	0.7994	-0.0006	0.0200

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
137	1 - 100	36.00	0.86
36	100 - 1000	212	6.2
5	1000 - 10000	2220.00	16

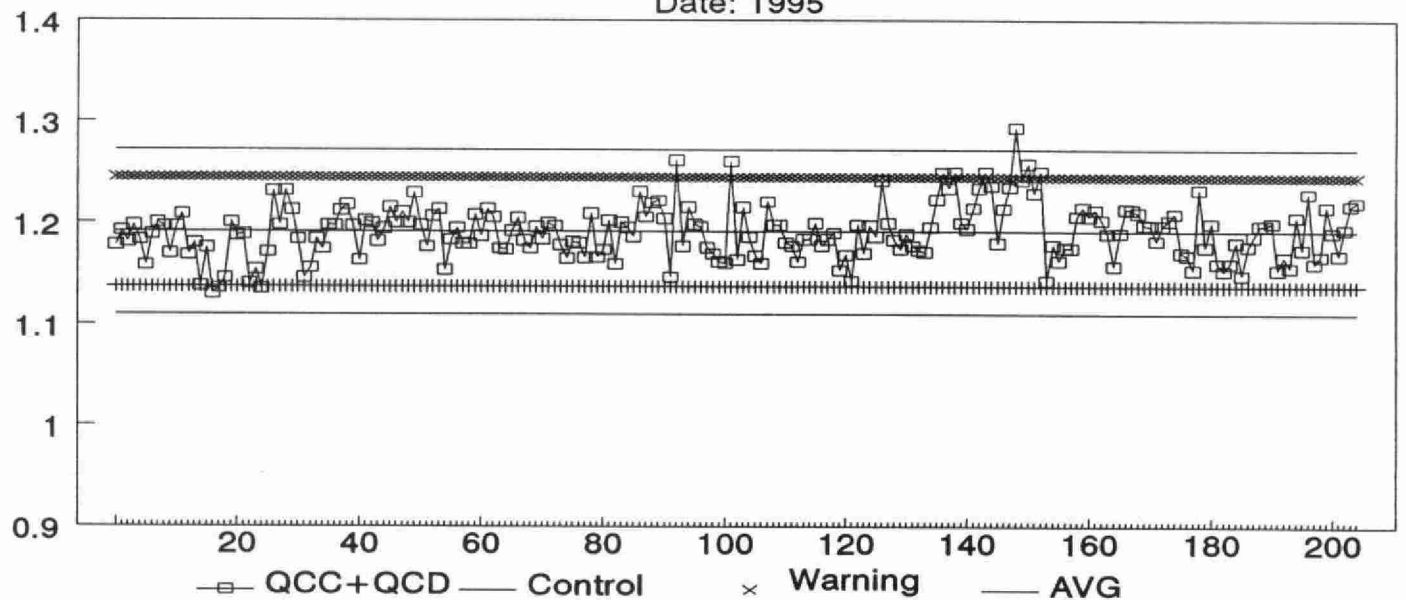
QC Difference Preconc. - Sr

Date: 1995



QC Sum Preconc. - Sr

Date: 1995



Titanium (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 1 - 15,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0454

Control Samples:

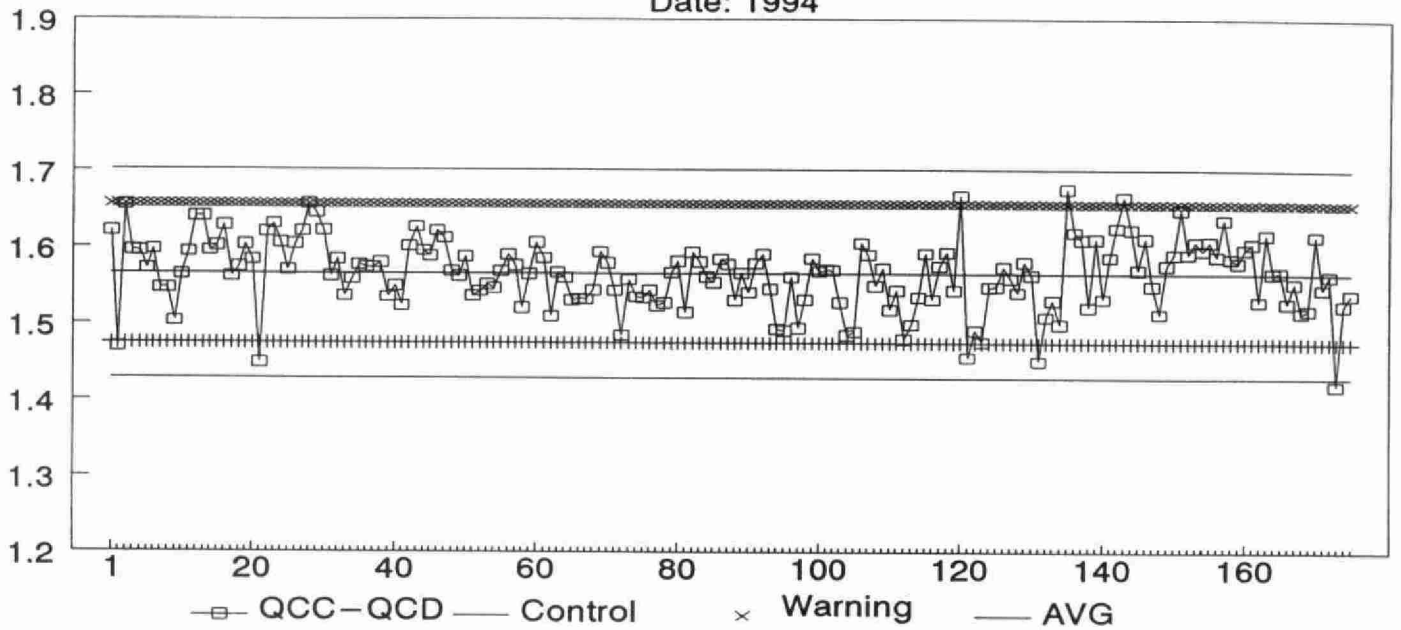
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	176	2.000	1.9491	-0.0509	0.0513
QCD:	176	0.400	0.3838	-0.0162	0.0099
QCC+QCD:	176	2.400	2.3329	-0.0671	0.0583
QCC-QCD:	176	1.600	1.5653	-0.0347	0.0454

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
167	1 - 100	3.36	0.37
7	100 - 1000	415	32.3
n/a	1000 - 10000	n/a	n/a

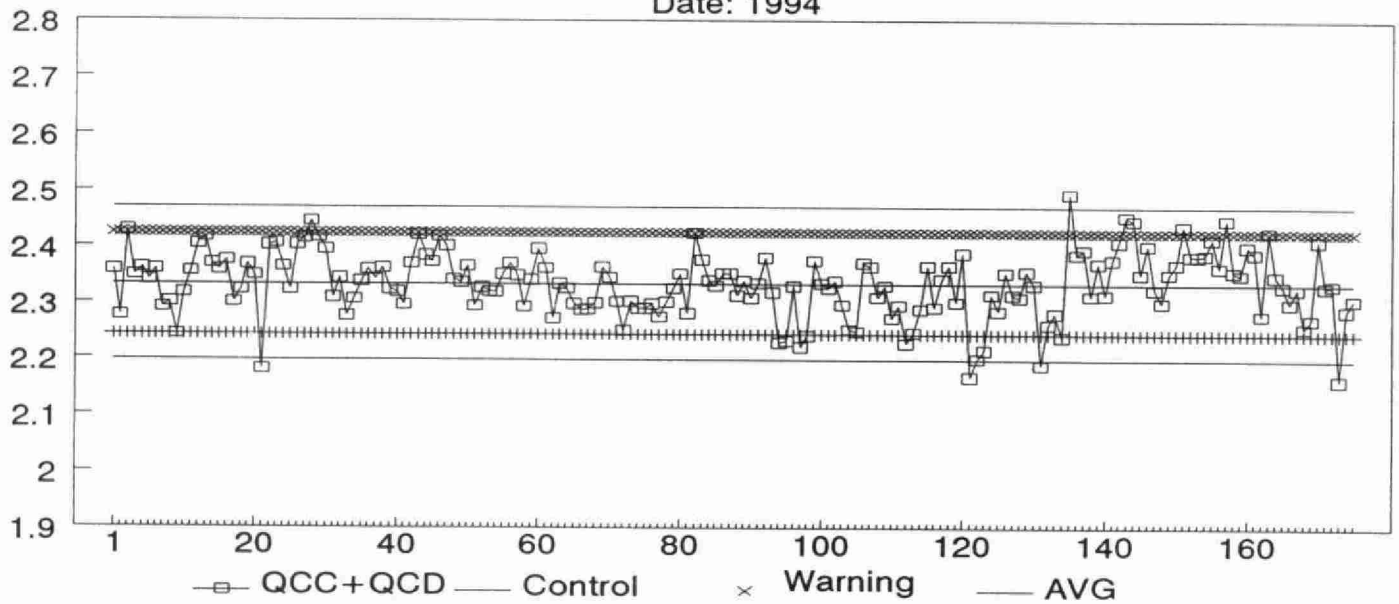
QC Difference Preconc. - Ti

Date: 1994



QC Sum Preconc. - Ti

Date: 1994



Titanium (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 1 - 15,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0461

Control Samples:

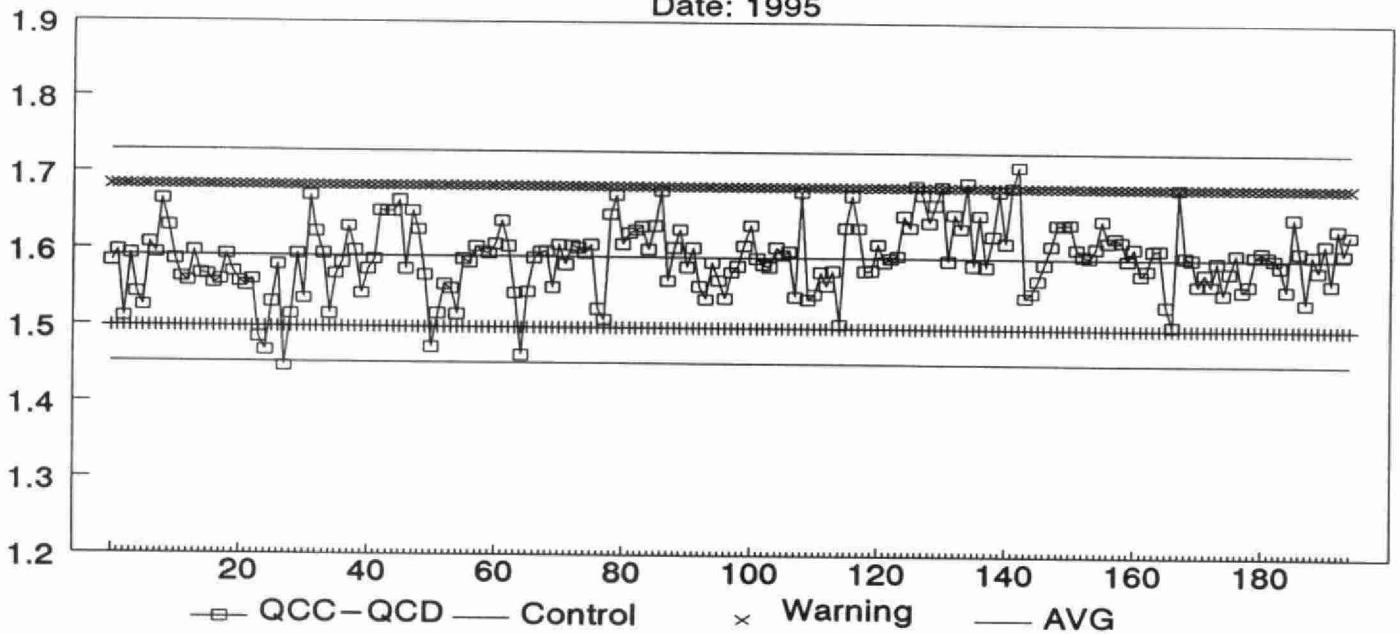
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	195	2.000	1.9744	-0.0256	0.0536
QCD:	195	0.400	0.3840	-0.0160	0.0107
QCC+QCD:	195	2.400	2.3584	-0.0416	0.0621
QCC-QCD:	195	1.600	1.5905	-0.0095	0.0461

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
163	1 - 100	4.70	0.42
6	100 - 1000	312	5.6
n/a	1000 - 10000	n/a	n/a

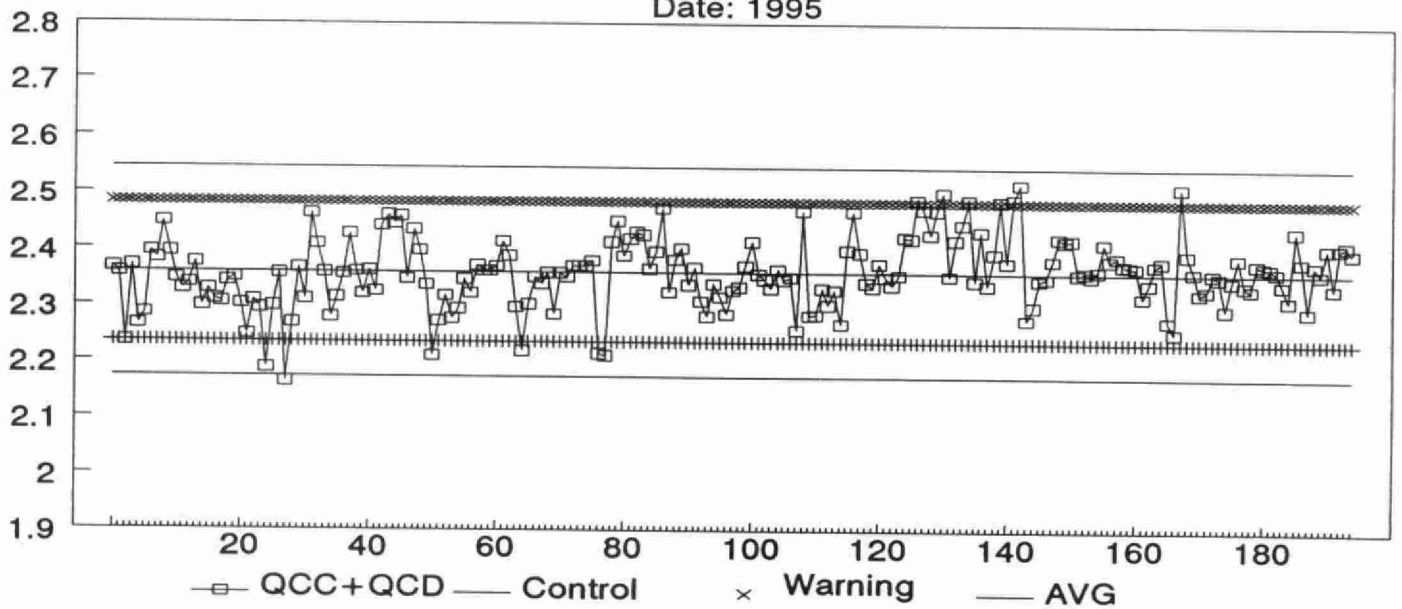
QC Difference Preconc. - Ti

Date: 1995



QC Sum Preconc. - Ti

Date: 1995



Vanadium (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 0.5 - 25,000 ug/L

Detection Limit (W): 0.5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0346

Control Samples:

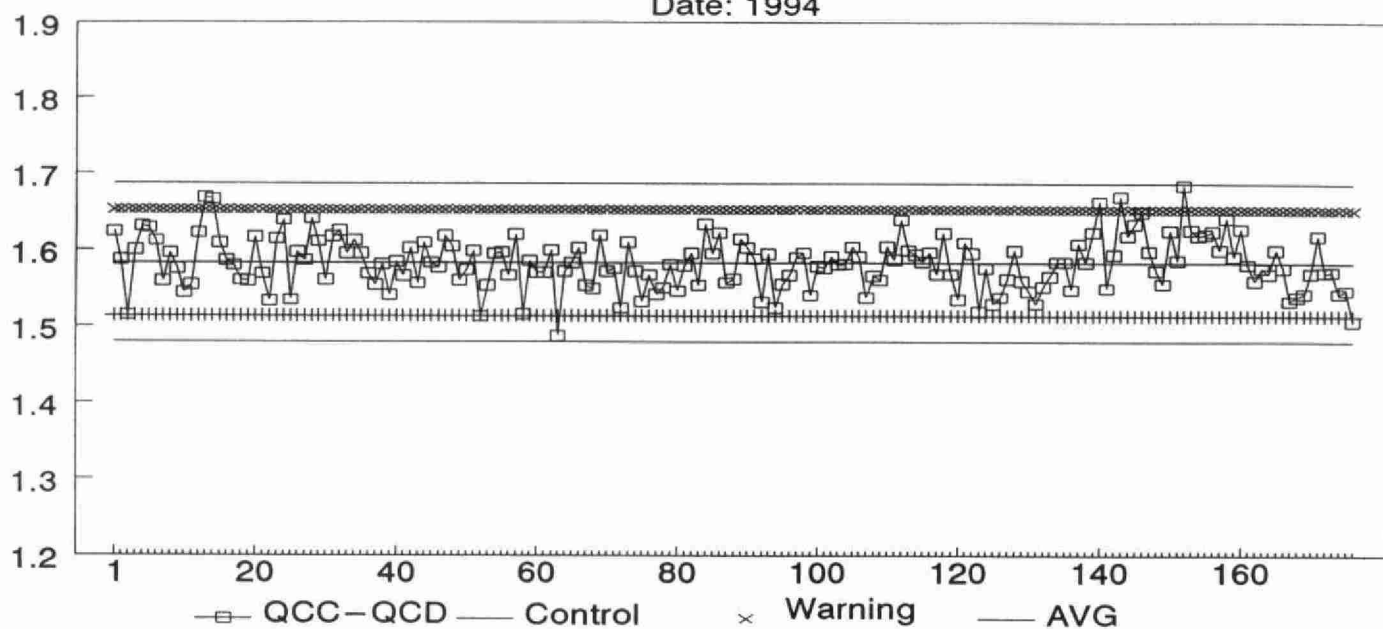
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	177	2.000	1.9752	-0.0248	0.0409
QCD:	177	0.400	0.3921	-0.0079	0.0099
QCC+QCD:	177	2.400	2.3674	-0.0326	0.0484
QCC-QCD:	177	1.600	1.5831	-0.0169	0.0346

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
183	0.5 - 50	1.85	0.34
n/a	50 - 500	n/a	n/a
n/a	500 - 5000	n/a	n/a

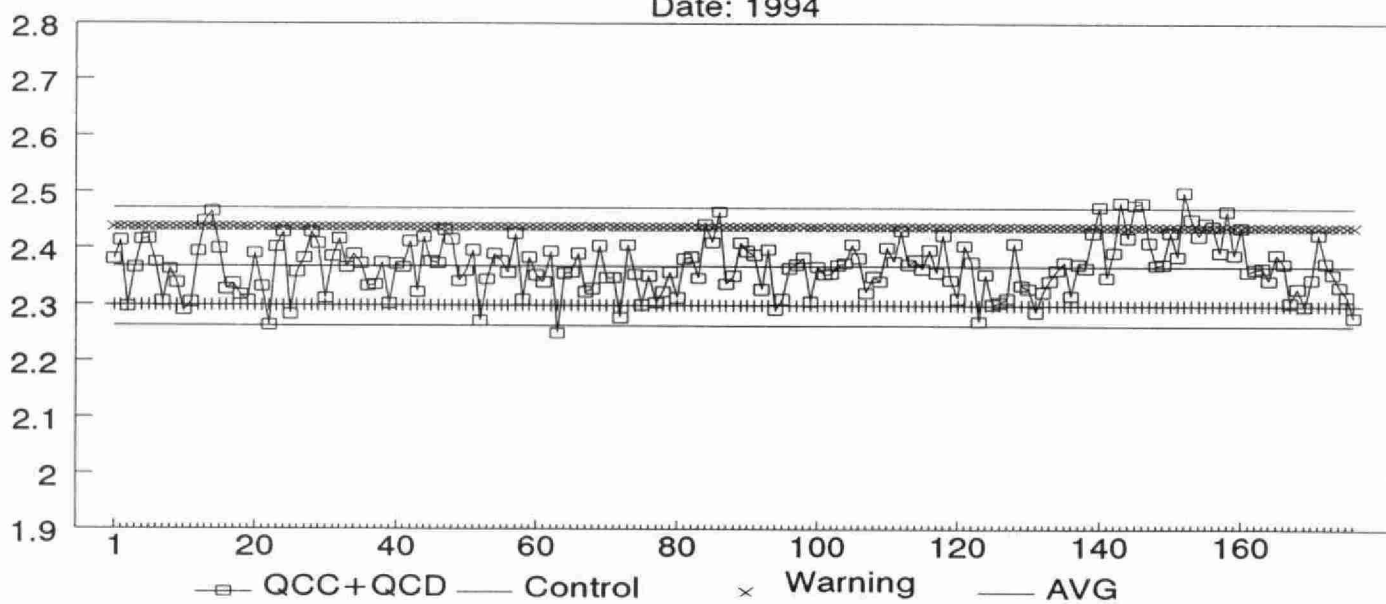
QC Difference Preconc. - V

Date: 1994



QC Sum Preconc. - V

Date: 1994



Vanadium (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 0.5 - 25,000 ug/L

Detection Limit (W): 0.5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0391

Control Samples:

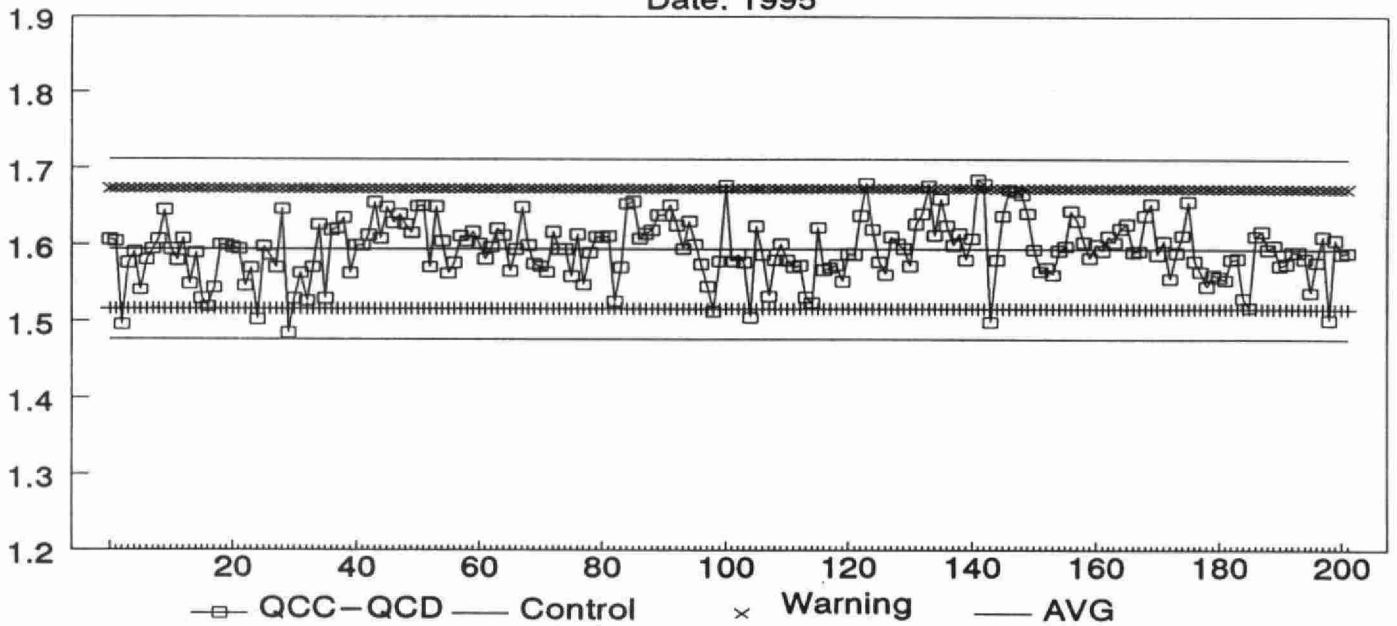
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	202	2.000	1.9842	-0.0158	0.0466
QCD:	202	0.400	0.3901	-0.0099	0.0094
QCC+QCD:	202	2.400	2.3744	-0.0256	0.0547
QCC-QCD:	202	1.600	1.5941	-0.0059	0.0391

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
182	0.5 - 50	1.44	0.17
n/a	50 - 500	n/a	n/a
n/a	500 - 5000	n/a	n/a

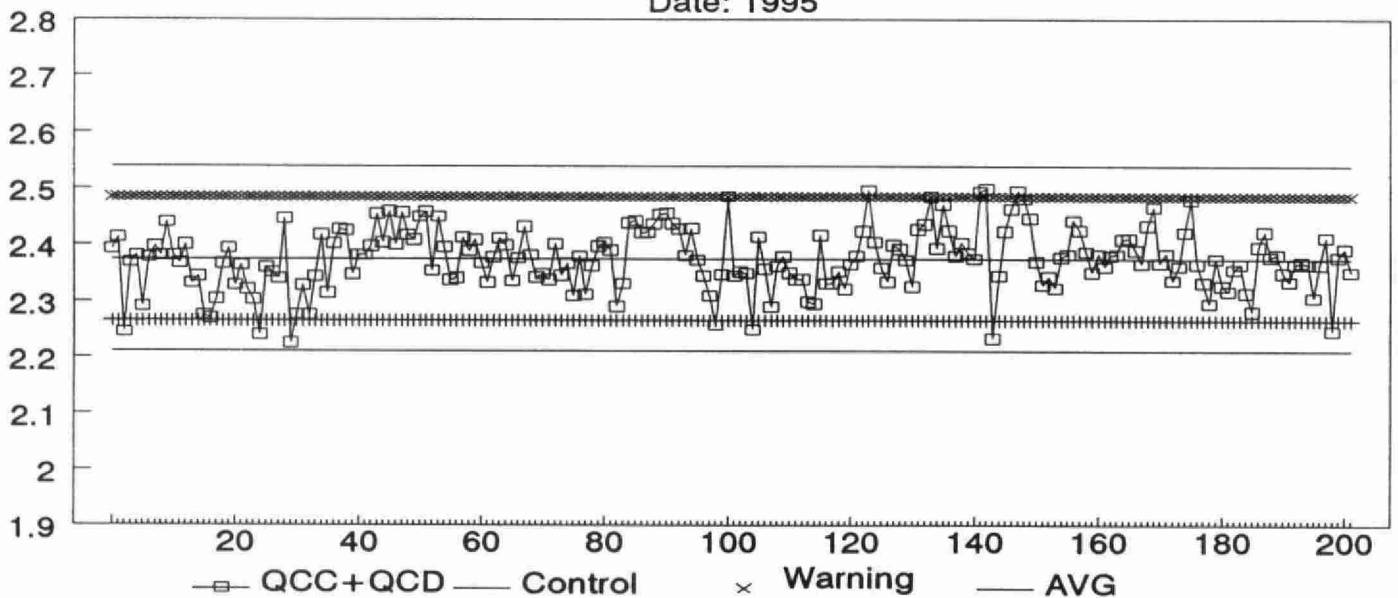
QC Difference Preconc. - V

Date: 1995



QC Sum Preconc. - V

Date: 1995



Yttrium (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 0.1 - 20,000 ug/L

Detection Limit (W): 0.1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0157

Control Samples:

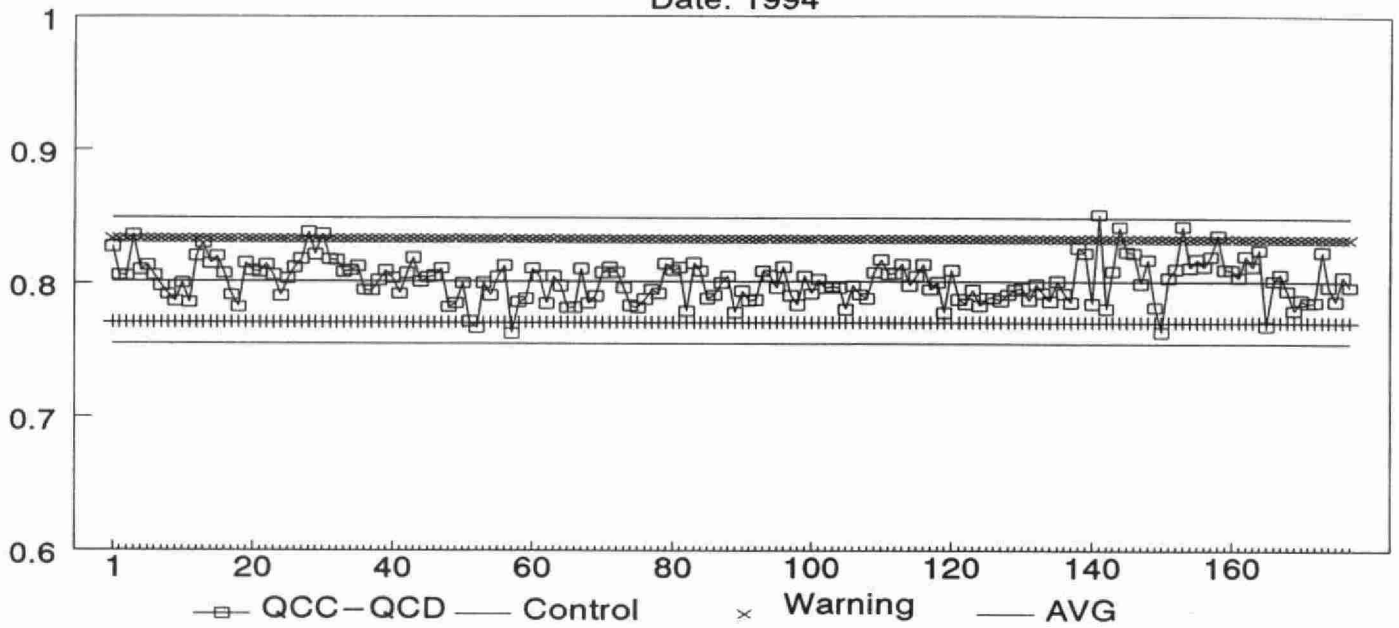
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	178	1.000	1.0000	0.0000	0.0181
QCD:	178	0.200	0.1980	-0.0020	0.0041
QCC+QCD:	178	1.200	1.1979	-0.0021	0.0210
QCC-QCD:	178	0.800	0.8020	0.0020	0.0157

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
182	0.1 - 10	0.37	0.05
n/a	10 - 100	n/a	n/a
n/a	100 - 1000	n/a	n/a

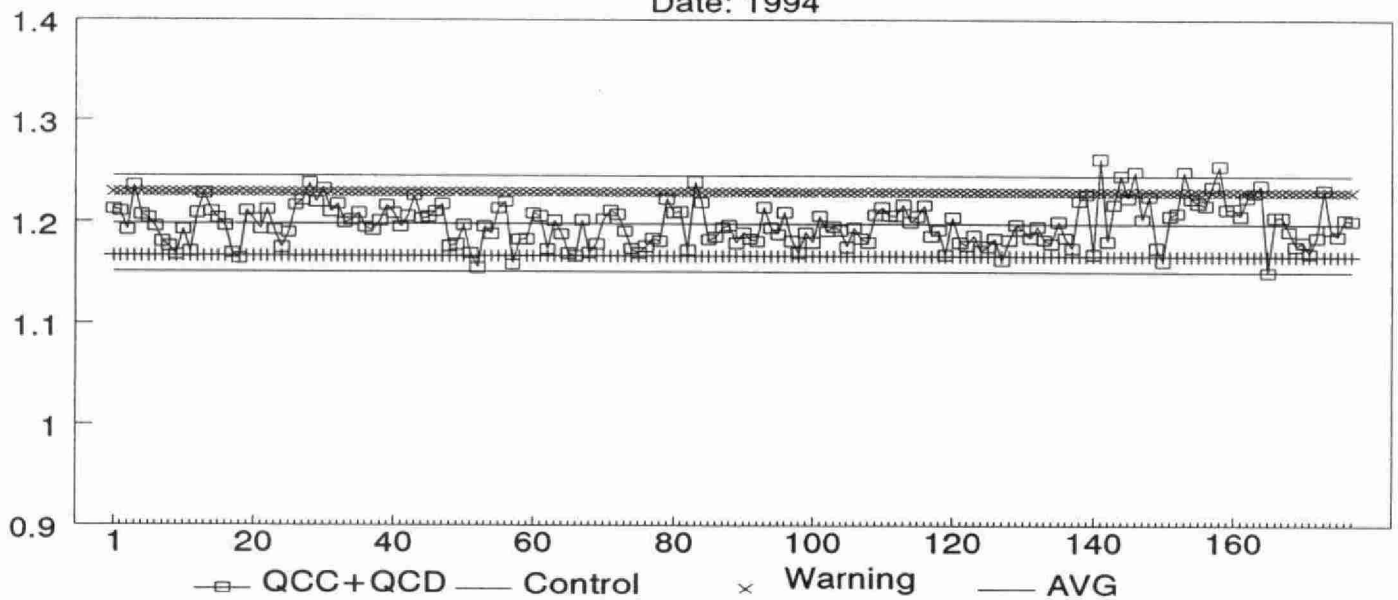
QC Difference Preconc. - Y

Date: 1994



QC Sum Preconc. - Y

Date: 1994



Yttrium (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 0.1 - 20,000 ug/L

Detection Limit (W): 0.1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0196

Control Samples:

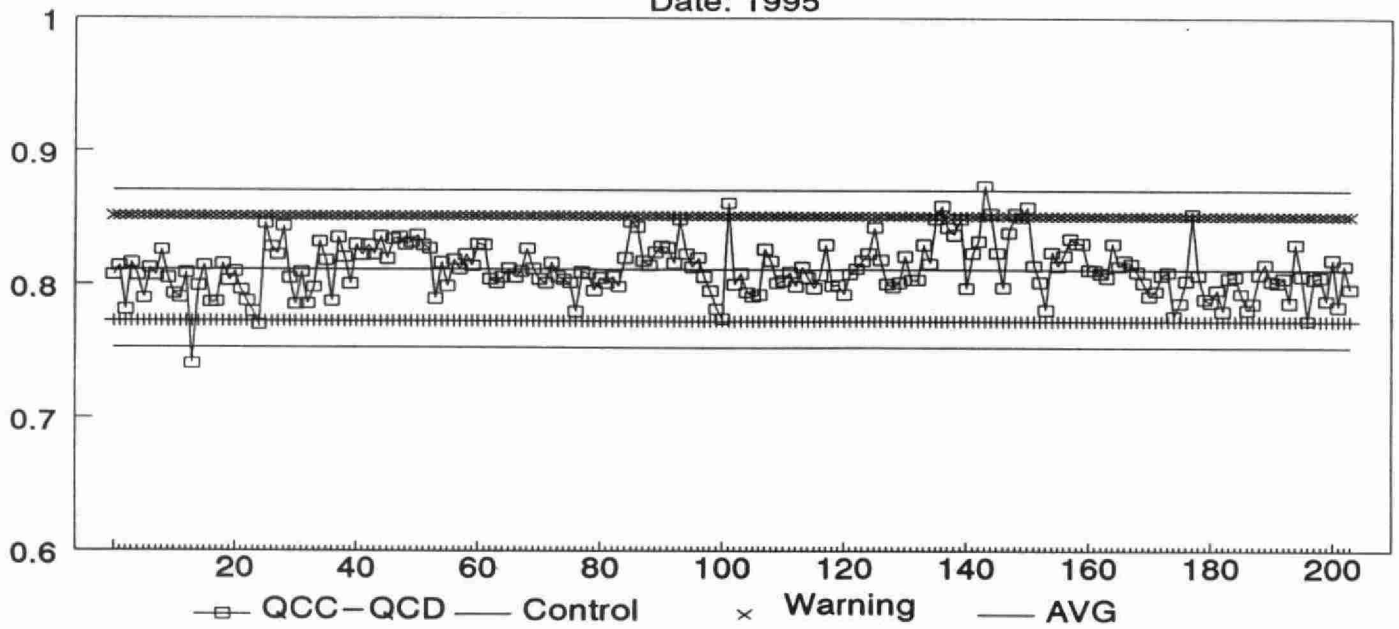
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	204	1.000	1.0087	0.0087	0.0231
QCD:	204	0.200	0.1971	-0.0029	0.0046
QCC+QCD:	204	1.200	1.2058	0.0058	0.0269
QCC-QCD:	204	0.800	0.8116	0.0116	0.0196

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
178	0.1 - 10	0.32	0.06
n/a	10 - 100	n/a	n/a
n/a	100 - 1000	n/a	n/a

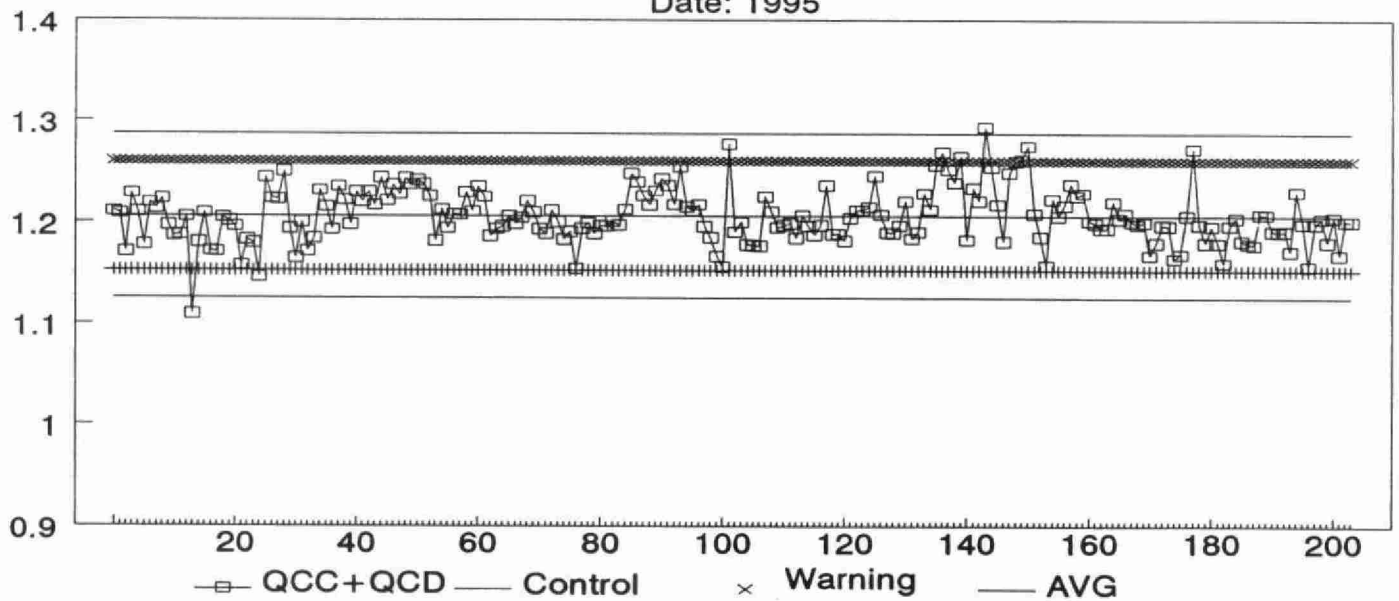
QC Difference Preconc. - Y

Date: 1995



QC Sum Preconc. - Y

Date: 1995



Zinc (Total) - Preconcentrated

Quality Control Data from 940101 to 941231

Analytical Range: 1 - 15,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0336

Control Samples:

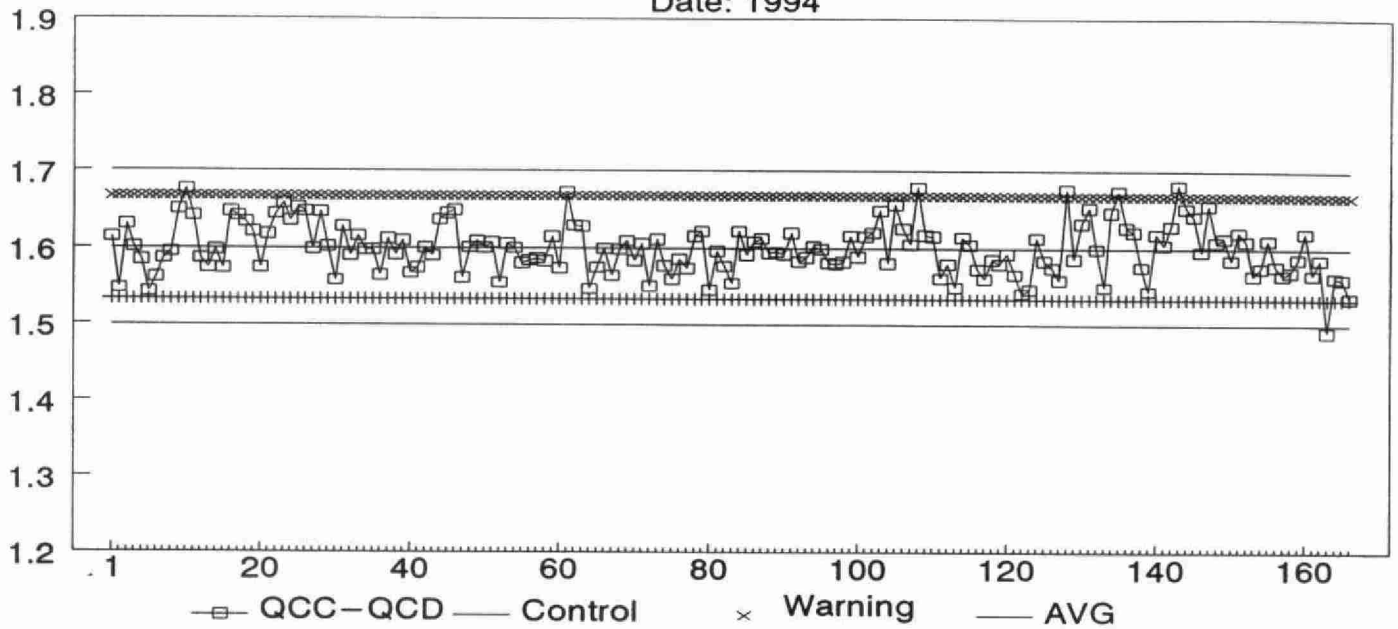
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	167	2.000	1.9997	-0.0003	0.0417
QCD:	167	0.400	0.4006	0.0006	0.0149
QCC+QCD:	167	2.400	2.4003	0.0003	0.0529
QCC-QCD:	167	1.600	1.5991	-0.0009	0.0336

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
162	1 - 100	16.38	0.90
12	100 - 1000	273	5.19
n/a	1000 - 10000	n/a	n/a

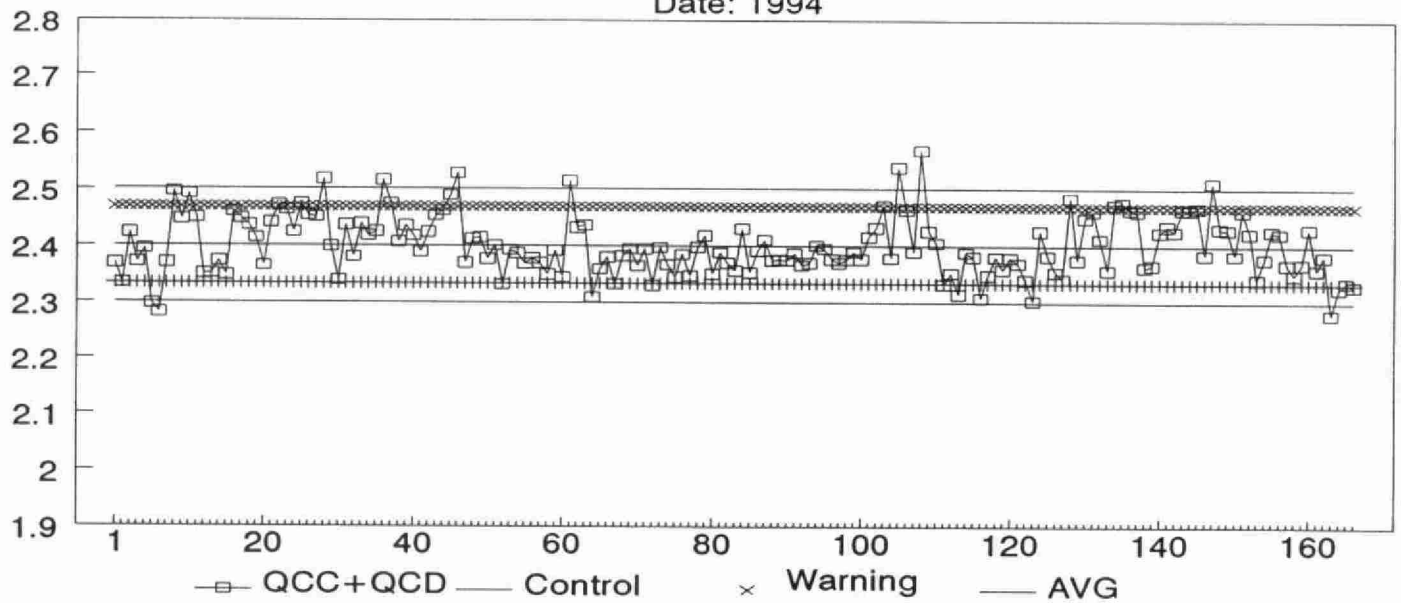
QC Difference Preconc. - Zn

Date: 1994



QC Sum Preconc. - Zn

Date: 1994



Zinc (Total) - Preconcentrated

Quality Control Data from 950101 to 951231

Analytical Range: 1 - 15,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0367

Control Samples:

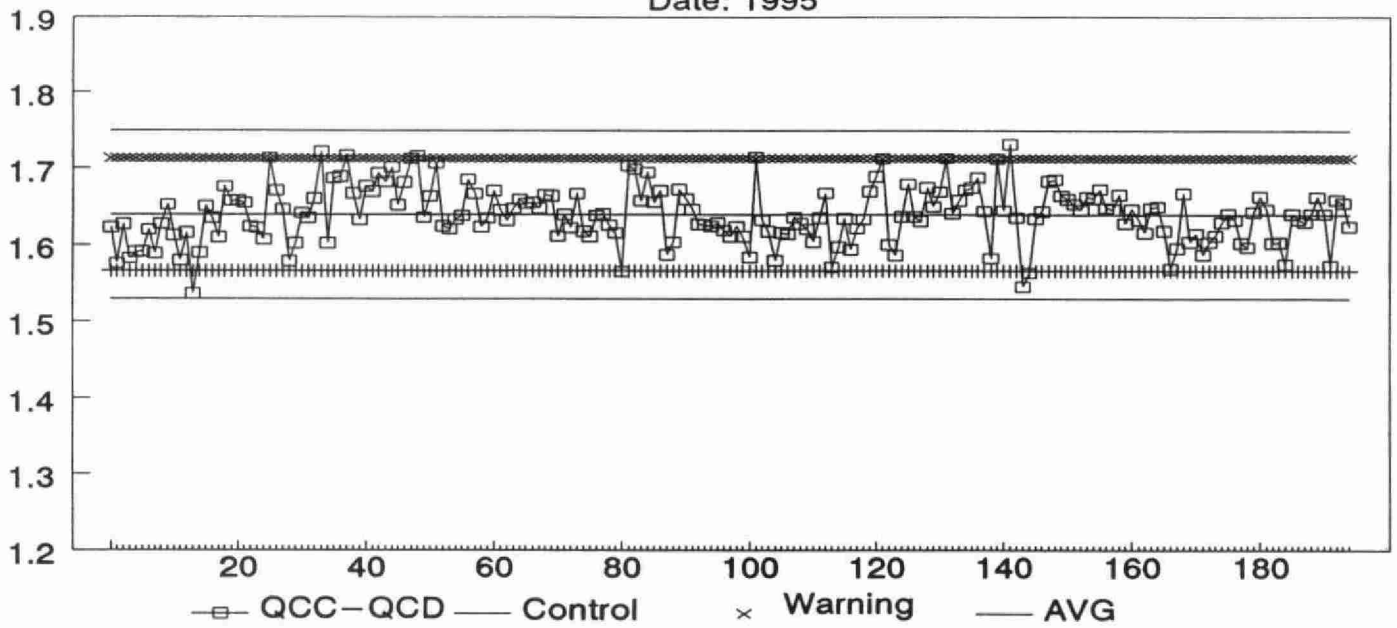
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	195	2.000	2.0442	0.0442	0.0432
QCD:	195	0.400	0.4049	0.0049	0.0100
QCC+QCD:	195	2.400	2.4491	0.0491	0.0508
QCC-QCD:	195	1.600	1.6393	0.0393	0.0367

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
163	1 - 100	13.00	0.56
13	100 - 1000	206	3.4
n/a	1000 - 10000	n/a	n/a

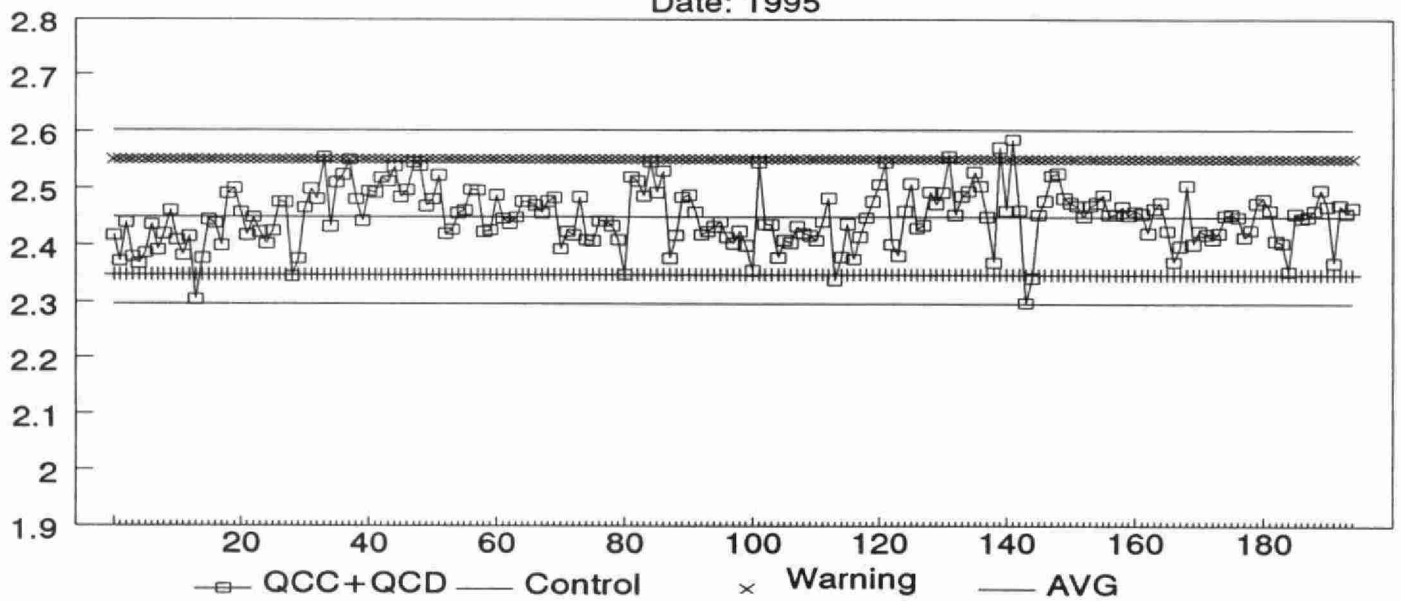
QC Difference Preconc. - Zn

Date: 1995



QC Sum Preconc. - Zn

Date: 1995



METALS WITHOUT PRECONCENTRATION (TRADES)

IDENTIFICATION:

Method Title: The Determination of Trace Metals in Industrial Effluents and Landfill Leachates by Inductively Coupled Plasma - Atomic Emission Spectrophotometry (ICP-AES).

Method Number: E6015A

Method Introduced: May, 1988

Current Revision: March 31, 1995

PARAMETER:	<u>Parameter Name</u>	<u>W(units)</u>	<u>T(units)</u>
	Yttrium	1.0 µg/L	5.0 µg/L
	Beryllium	1.0 µg/L	5.0 µg/L
	Cadmium	2.0 µg/L	10.0 µg/L
	Cobalt	2.0 µg/L	10.0 µg/L
	Manganese	2.0 µg/L	10.0 µg/L
	Strontium	2.0 µg/L	10.0 µg/L
	Vanadium	2.0 µg/L	10.0 µg/L
	Barium	5.0 µg/L	25.0 µg/L
	Chromium	5.0 µg/L	25.0 µg/L
	Copper	5.0 µg/L	25.0 µg/L
	Molybdenum	5.0 µg/L	25.0 µg/L
	Nickel	5.0 µg/L	25.0 µg/L
	Titanium	5.0 µg/L	25.0 µg/L
	Zinc	10.0 µg/L	50.0 µg/L
	Lead	20.0 µg/L	100.0 µg/L
	Aluminum	50.0 µg/L	250.0 µg/L
	Iron	50.0 µg/L	250.0 µg/L

SAMPLE MATRICES:

Sample matrices analyzed are industrial effluents and leachates.

ANALYTICAL PROCEDURE:

Samples are subjected to nitric-hydrochloric acid digestion followed by analysis by ICP-AES.

1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐ 15. ☐ 16. ☐ 17. ☐ 18. ☐ 19. ☐ 20. ☐ 21. ☐ 22. ☐ 23. ☐ 24. ☐ 25. ☐ 26. ☐ 27. ☐ 28. ☐ 29. ☐ 30. ☐ 31. ☐ 32. ☐ 33. ☐ 34. ☐ 35. ☐ 36. ☐ 37. ☐ 38. ☐ 39. ☐ 40. ☐ 41. ☐ 42. ☐ 43. ☐ 44. ☐ 45. ☐ 46. ☐ 47. ☐ 48. ☐ 49. ☐ 50. ☐ 51. ☐ 52. ☐ 53. ☐ 54. ☐ 55. ☐ 56. ☐ 57. ☐ 58. ☐ 59. ☐ 60. ☐ 61. ☐ 62. ☐ 63. ☐ 64. ☐ 65. ☐ 66. ☐ 67. ☐ 68. ☐ 69. ☐ 70. ☐ 71. ☐ 72. ☐ 73. ☐ 74. ☐ 75. ☐ 76. ☐ 77. ☐ 78. ☐ 79. ☐ 80. ☐ 81. ☐ 82. ☐ 83. ☐ 84. ☐ 85. ☐ 86. ☐ 87. ☐ 88. ☐ 89. ☐ 90. ☐ 91. ☐ 92. ☐ 93. ☐ 94. ☐ 95. ☐ 96. ☐ 97. ☐ 98. ☐ 99. ☐ 100. ☐

Reporting:	Maximum Significant Figures:	2
	Units:	µg/L (ppb)

Aluminum (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 50 - 500,000 ug/L

Detection Limit (W): 50 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.2165

Control Samples:

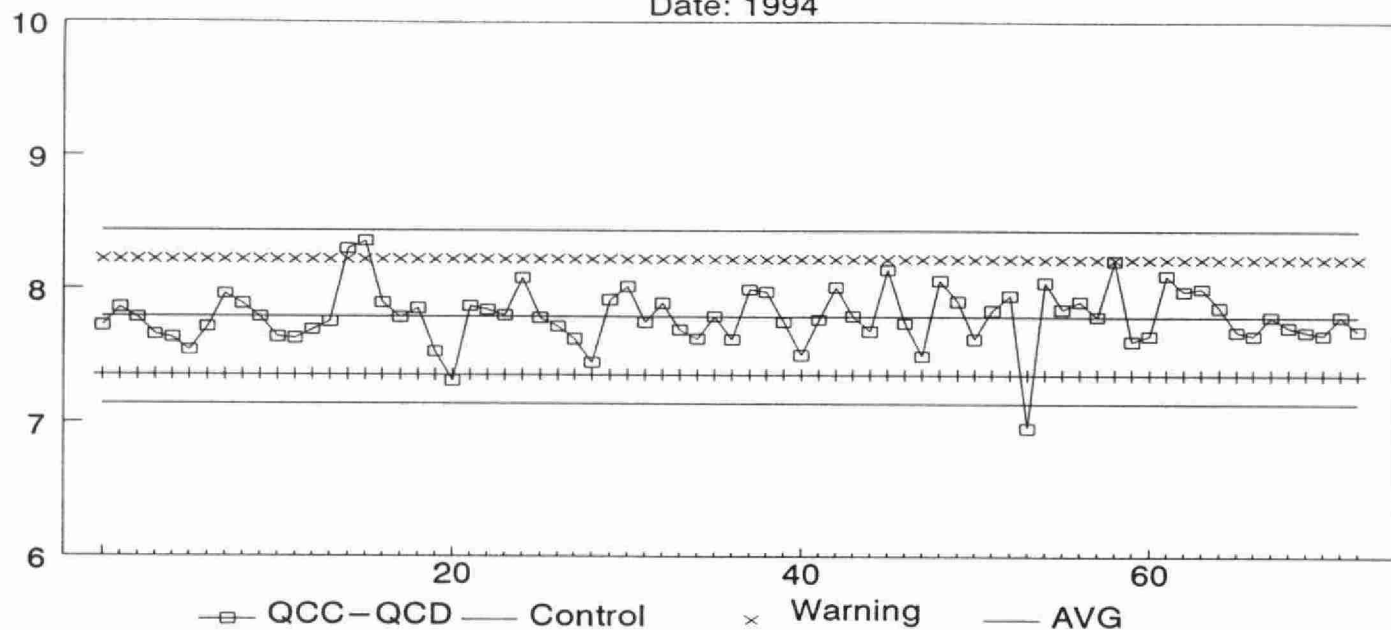
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	73	10.000	9.7263	-0.2737	0.2397
QCD:	73	2.000	1.9365	-0.0635	0.1145
QCC+QCD:	73	12.000	11.6629	-0.3371	0.3071
QCC-QCD:	73	8.000	7.7898	-0.2102	0.2165

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
59	5 - 5000	137.00	32.00
n/a	5000 - 50000	n/a	n/a
n/a	50000 - 500000	n/a	n/a

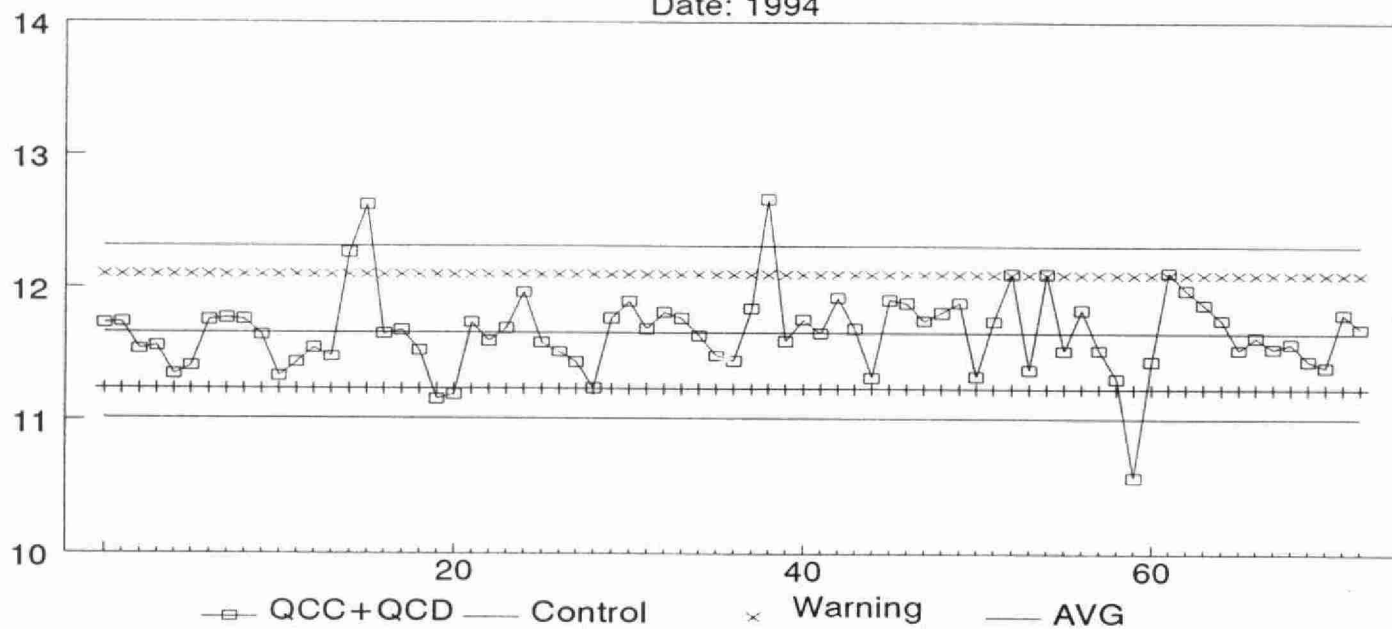
QC Difference Trades - AI

Date: 1994



QC Sum Trades Plot - AI

Date: 1994



Aluminum (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 50 - 500,000 ug/L

Detection Limit (W): 50 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.2101

Control Samples:

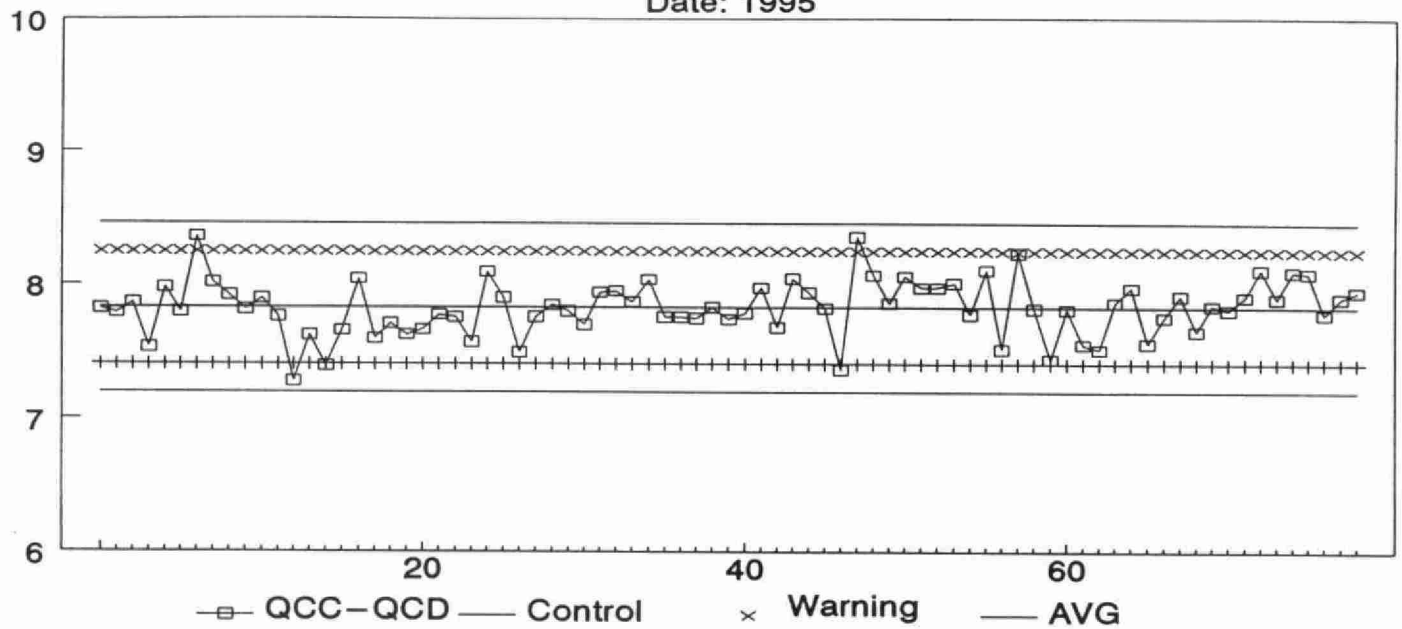
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	79	10.000	9.7809	-0.2191	0.2338
QCD:	79	2.000	1.9539	-0.0461	0.0900
QCC+QCD:	79	12.000	11.7348	-0.2652	0.2853
QCC-QCD:	79	8.000	7.8270	-0.1730	0.2101

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
82	5 - 5000	230.00	27.00
n/a	5000 - 50000	n/a	n/a
n/a	50000 - 500000	n/a	n/a

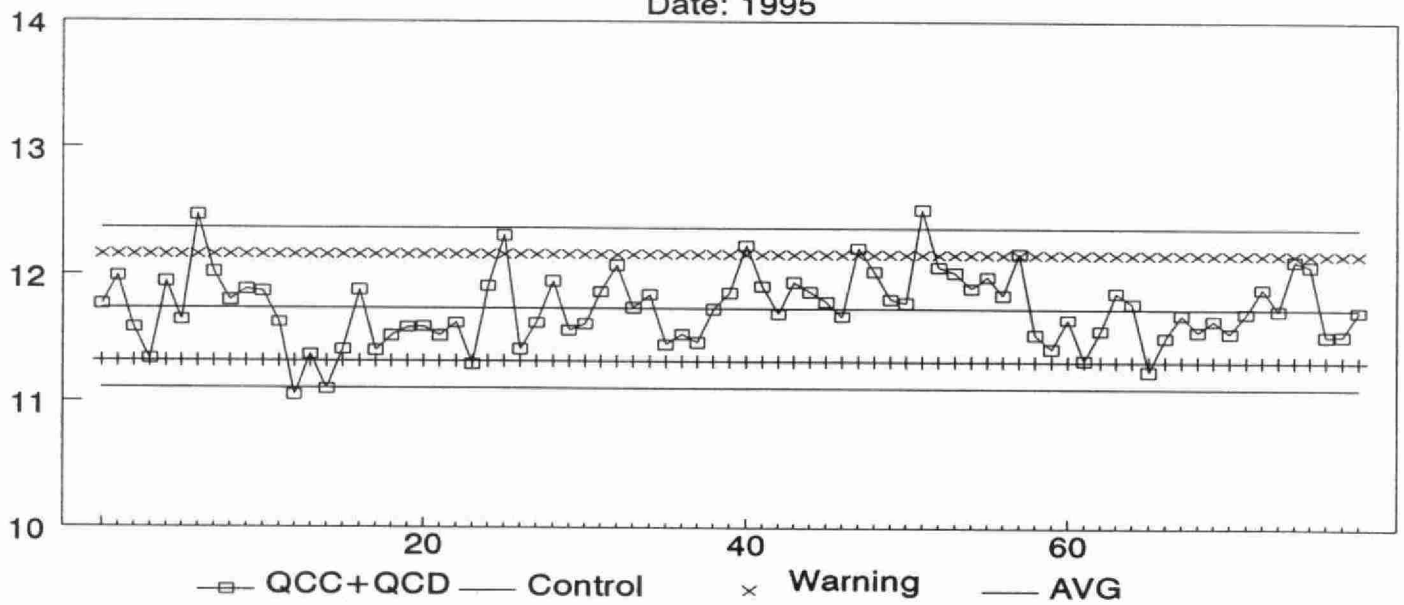
QC Difference Trades - AI

Date: 1995



QC Sum Trades - AI

Date: 1995



Barium (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 5 - 10,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.2101

Control Samples:

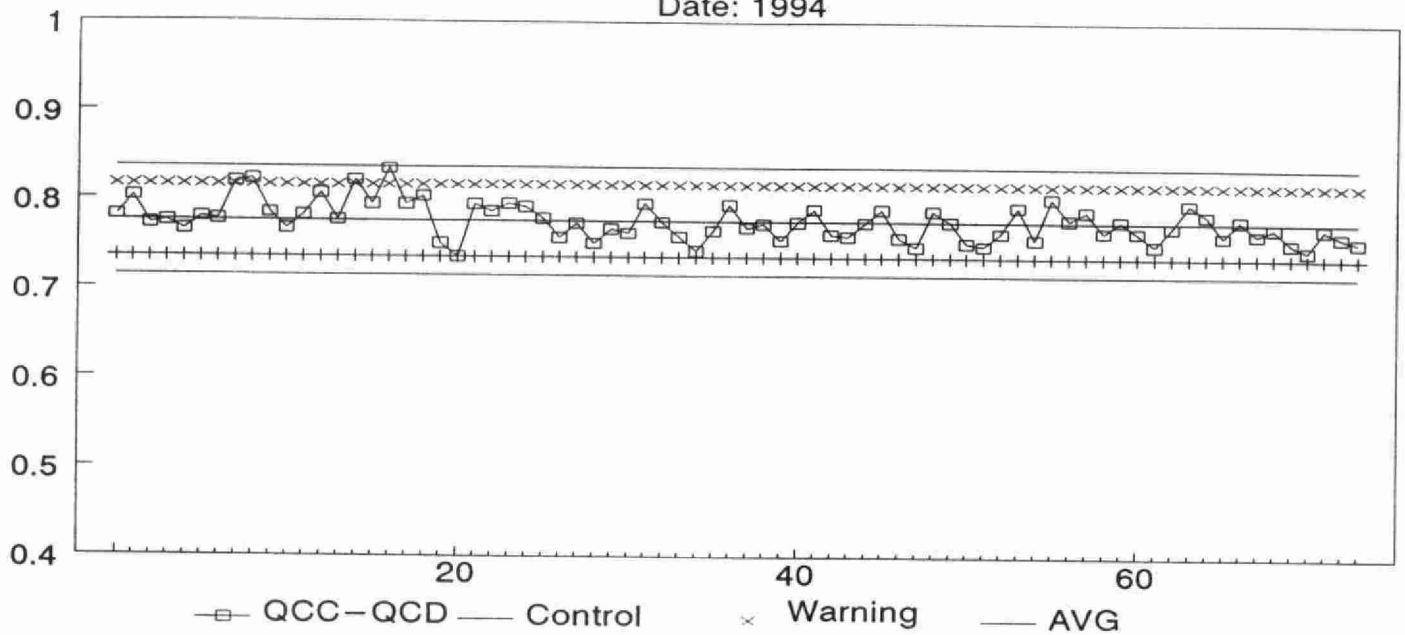
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	74	1.000	0.9682	-0.0318	0.0227
QCD:	74	0.200	0.1924	-0.0076	0.0048
QCC+QCD:	74	1.200	1.1607	-0.0393	0.0259
QCC-QCD:	74	0.800	0.7758	-0.0242	0.0202

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
66	5 - 500	58.50	1.74
n/a	500 - 5000	n/a	n/a
n/a	5000 - 50000	n/a	n/a

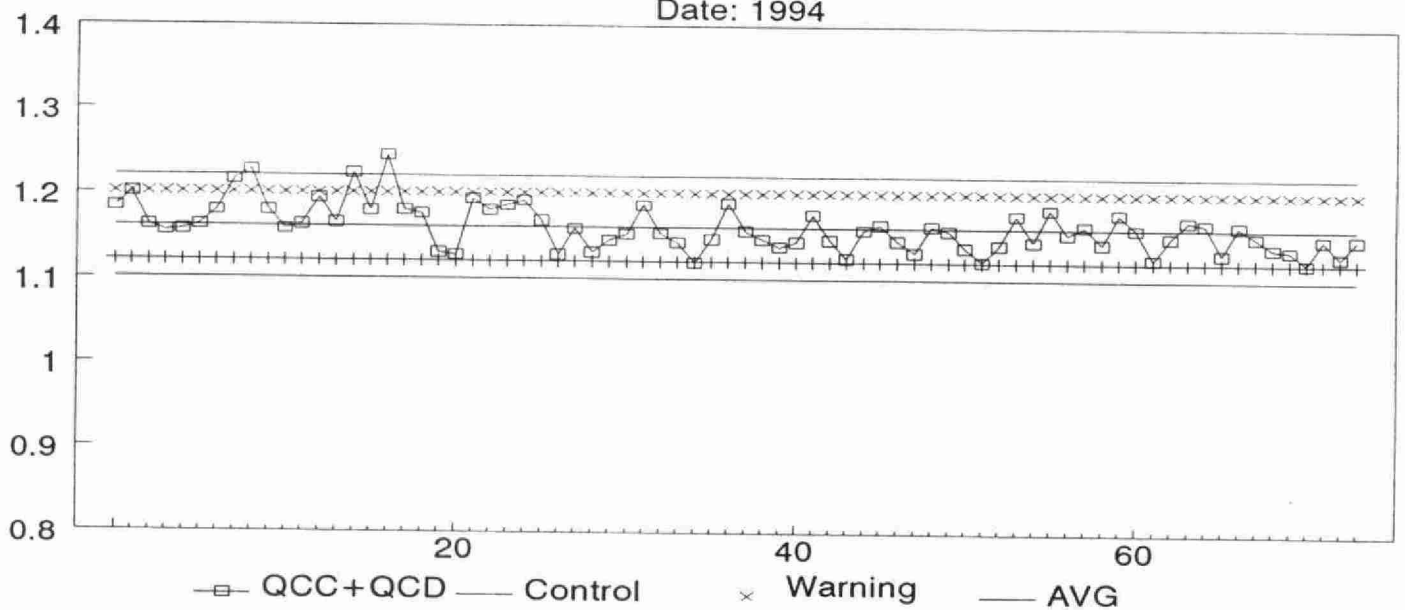
QC Difference Trades - Ba

Date: 1994



QC Sum Trades - Ba

Date: 1994



Barium (Total) - Trades**Quality Control Data from 950101 to 951231**

Analytical Range: 5 - 10,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0236

Control Samples:

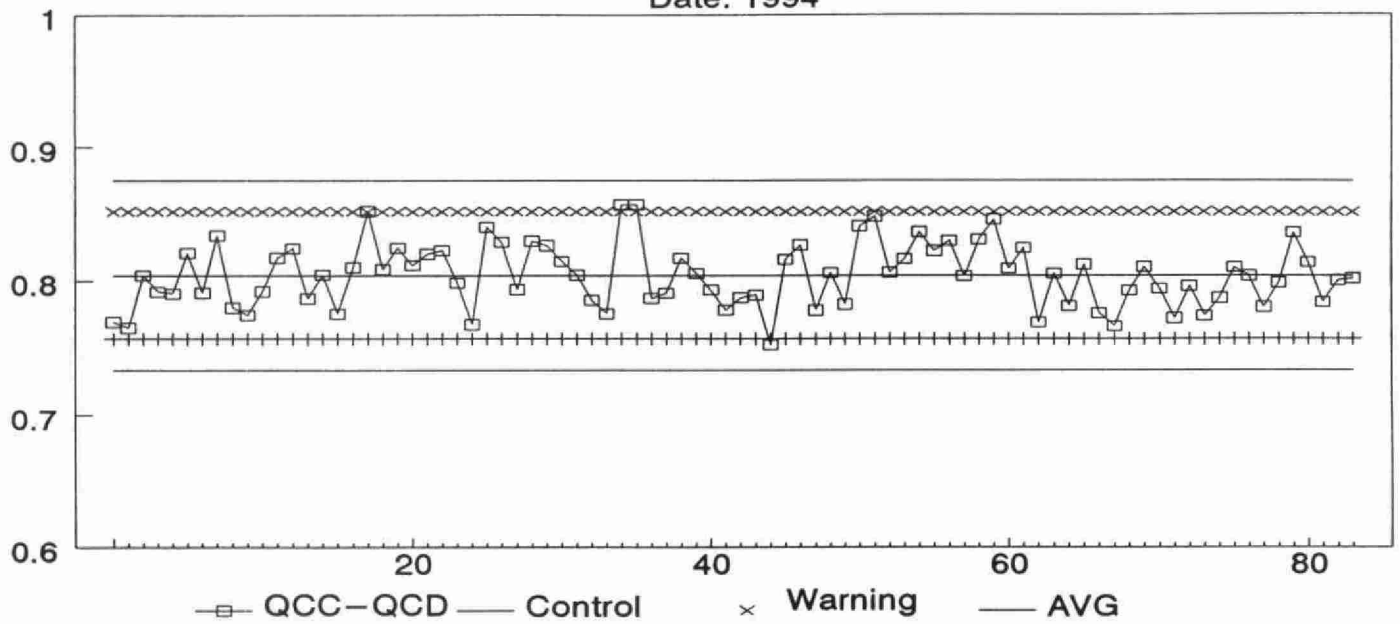
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	84	1.000	1.0056	0.0056	0.0263
QCD:	84	0.200	0.2014	0.0014	0.0070
QCC+ QCD:	84	1.200	1.2070	0.0070	0.0304
QCC-QCD:	84	0.800	0.8043	0.0043	0.0236

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
78	5 - 500	65.80	2.39
n/a	500 - 5000	n/a	n/a
n/a	5000 - 50000	n/a	n/a

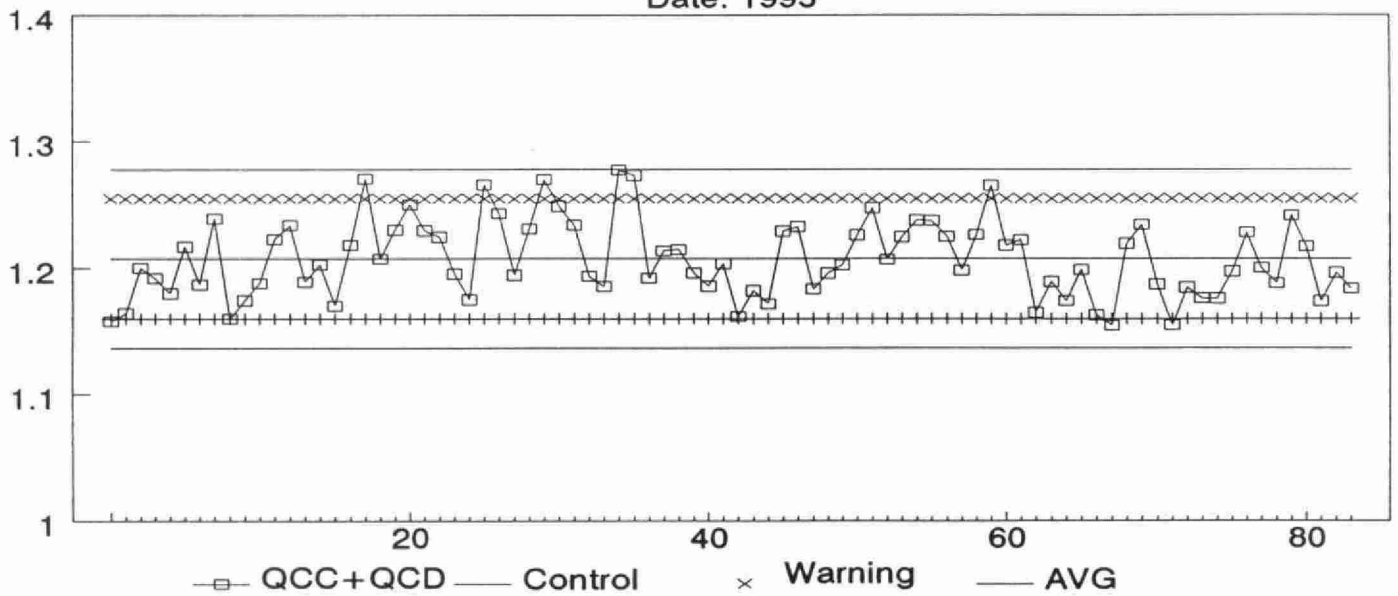
QC Difference Trades - Ba

Date: 1994



QC Sum Trades - Ba

Date: 1995



Beryllium (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 1 - 10,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0350

Control Samples:

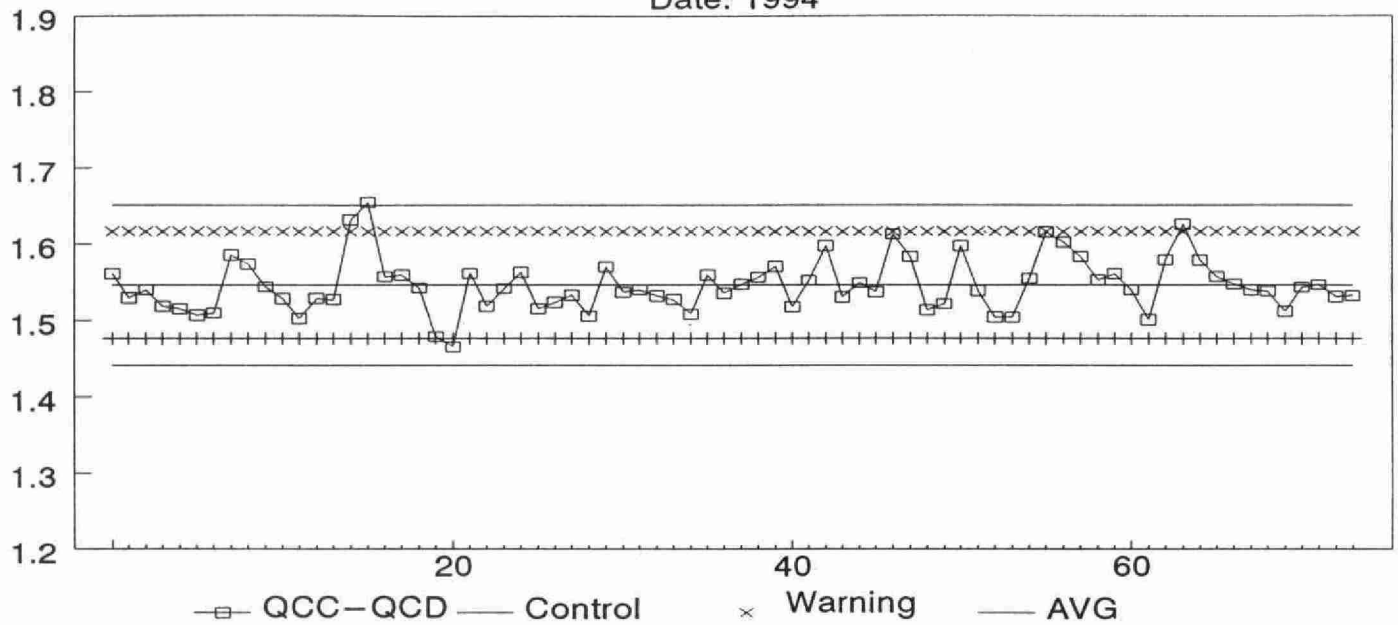
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	74	2.000	1.9233	-0.0767	0.0381
QCD:	74	0.400	0.3771	-0.0229	0.0088
QCC+QCD:	74	2.400	2.3004	-0.0996	0.0428
QCC-QCD:	74	1.600	1.5461	-0.0539	0.0350

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
71	1 - 100	0.23	0.16
n/a	100 - 1000	n/a	n/a
n/a	1000 - 10000	n/a	n/a

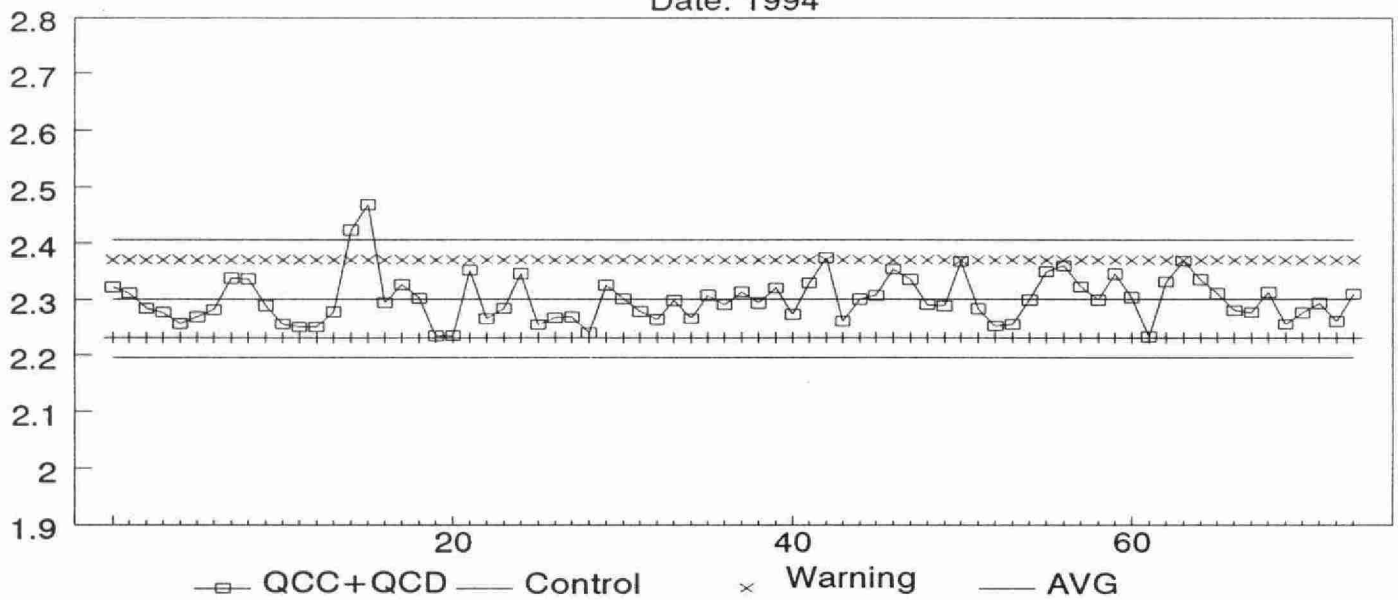
QC Difference Trades - Be

Date: 1994



QC Sum Trades - Be

Date: 1994



Beryllium (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 1 - 10,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0403

Control Samples:

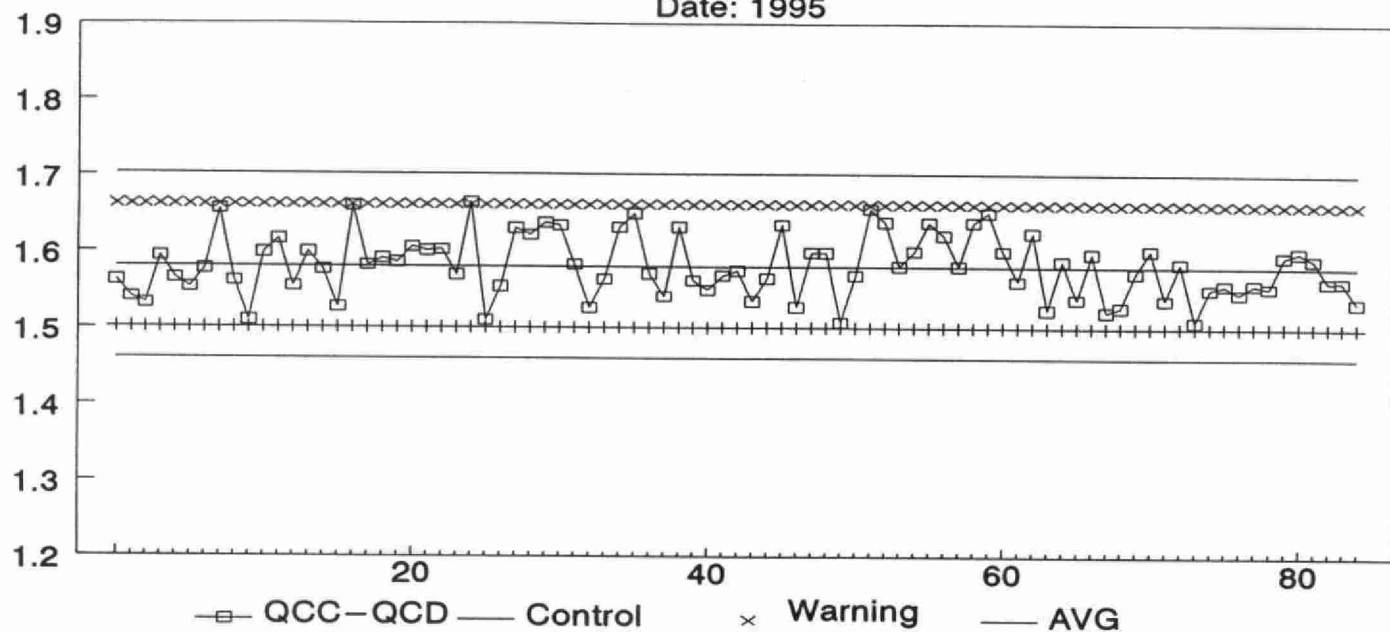
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	85	2.000	1.9609	-0.0391	0.0451
QCD:	85	0.400	0.3796	-0.0204	0.0083
QCC+QCD:	85	2.400	2.3406	-0.0594	0.0508
QCC-QCD:	85	1.600	1.5813	-0.0187	0.0403

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
84	1 - 100	0.24	0.21
n/a	100 - 1000	n/a	n/a
n/a	1000 - 10000	n/a	n/a

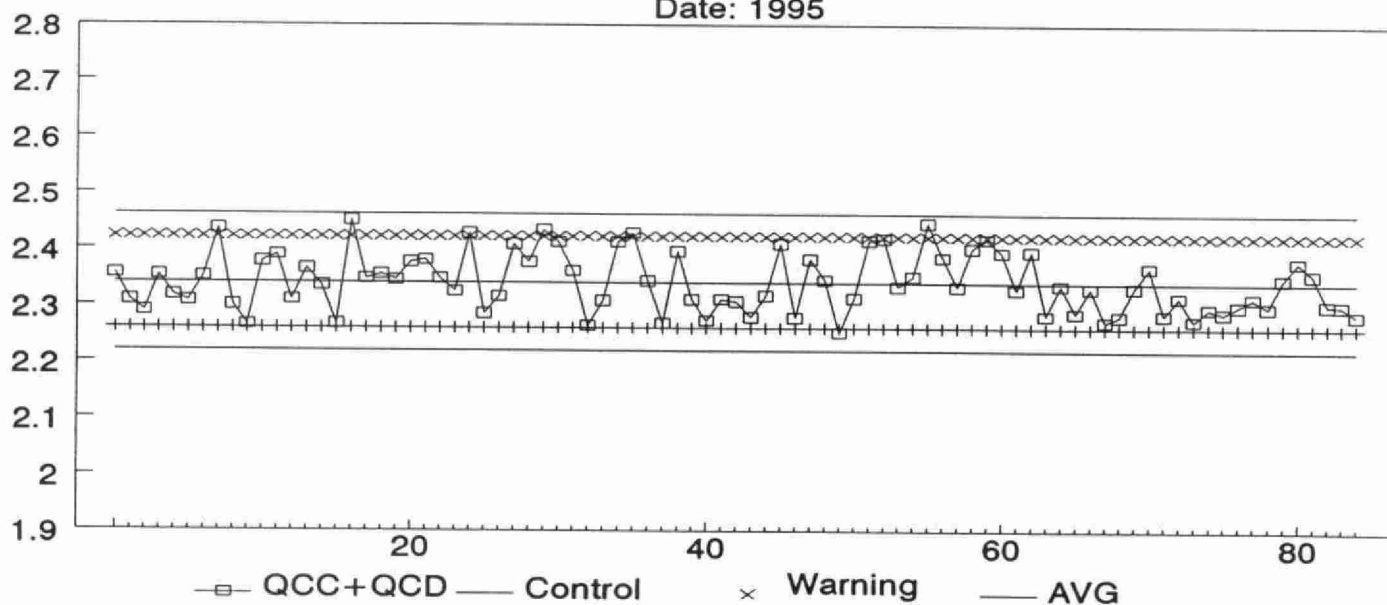
QC Difference Trades - Be

Date: 1995



QC Sum Trades - Be

Date: 1995



Cadmium (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 2 - 15,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0243

Control Samples:

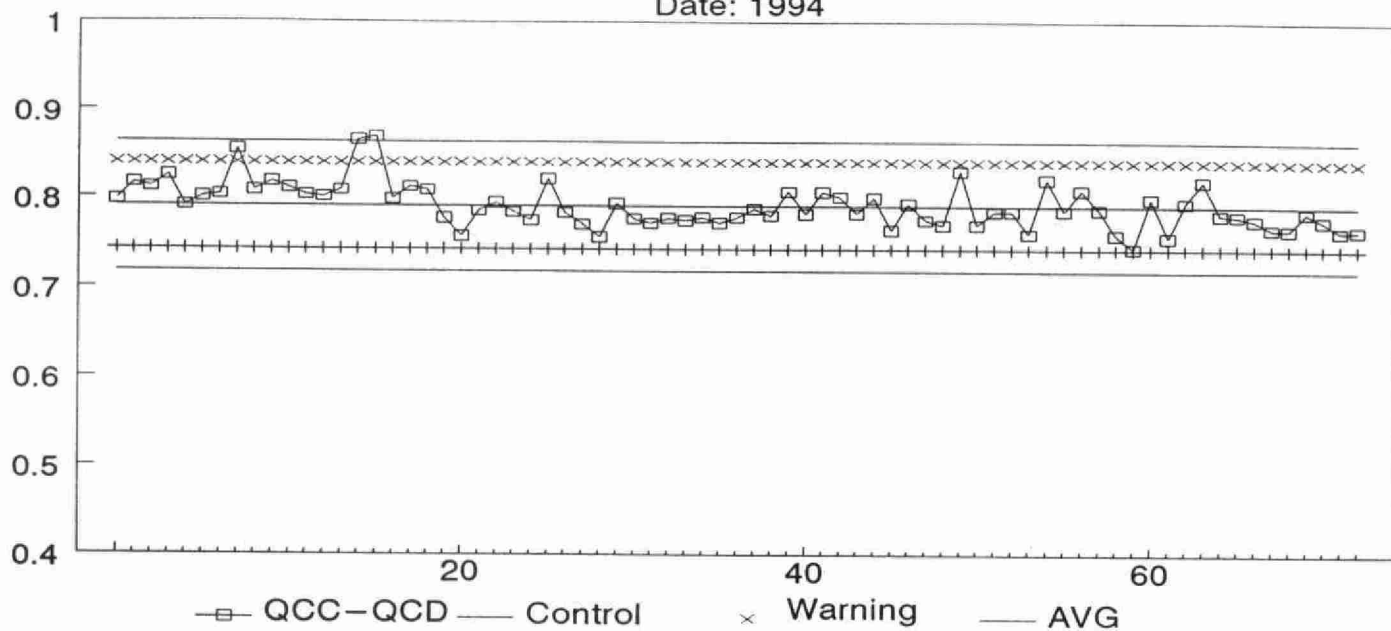
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	73	1.000	0.9855	-0.0145	0.0275
QCD:	73	0.200	0.1942	-0.0058	0.0066
QCC+QCD:	73	1.200	1.1797	-0.0203	0.0318
QCC-QCD:	73	0.800	0.7913	-0.0087	0.0243

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
71	2 - 200	0.92	0.07
n/a	200 - 2000	n/a	n/a
n/a	2000 - 15000	n/a	n/a

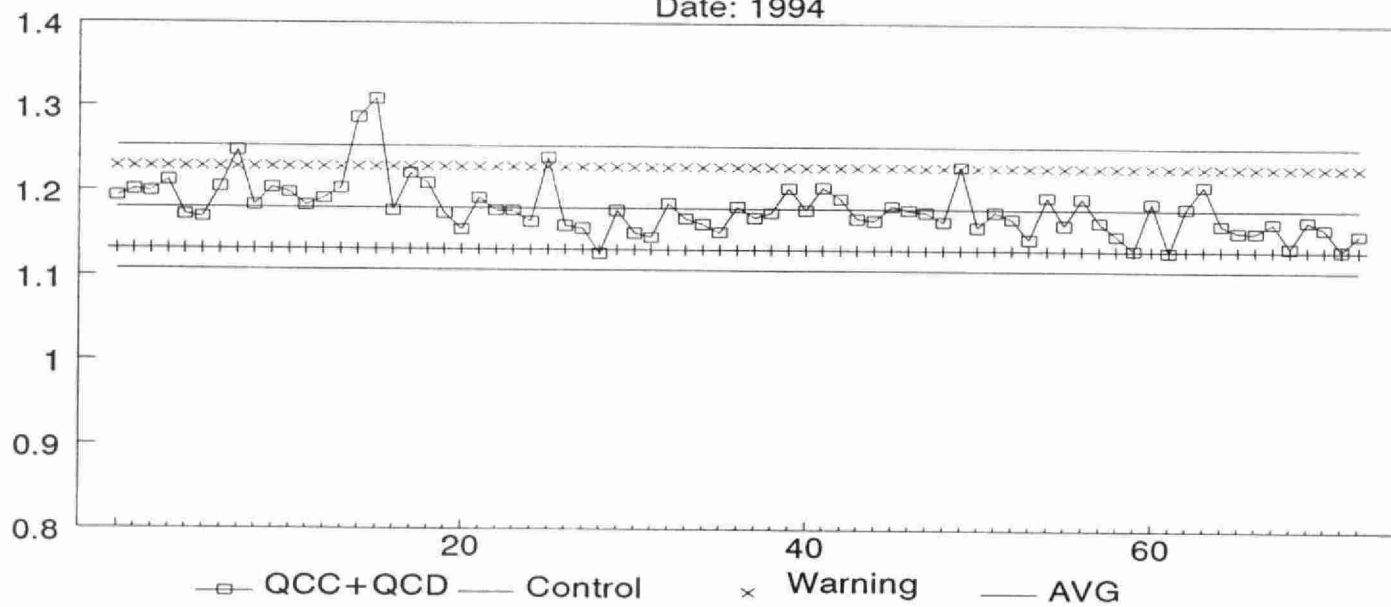
QC Difference Trades - Cd

Date: 1994



QC Sum Trades - Cd

Date: 1994



Cadmium (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 2 - 15,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0210

Control Samples:

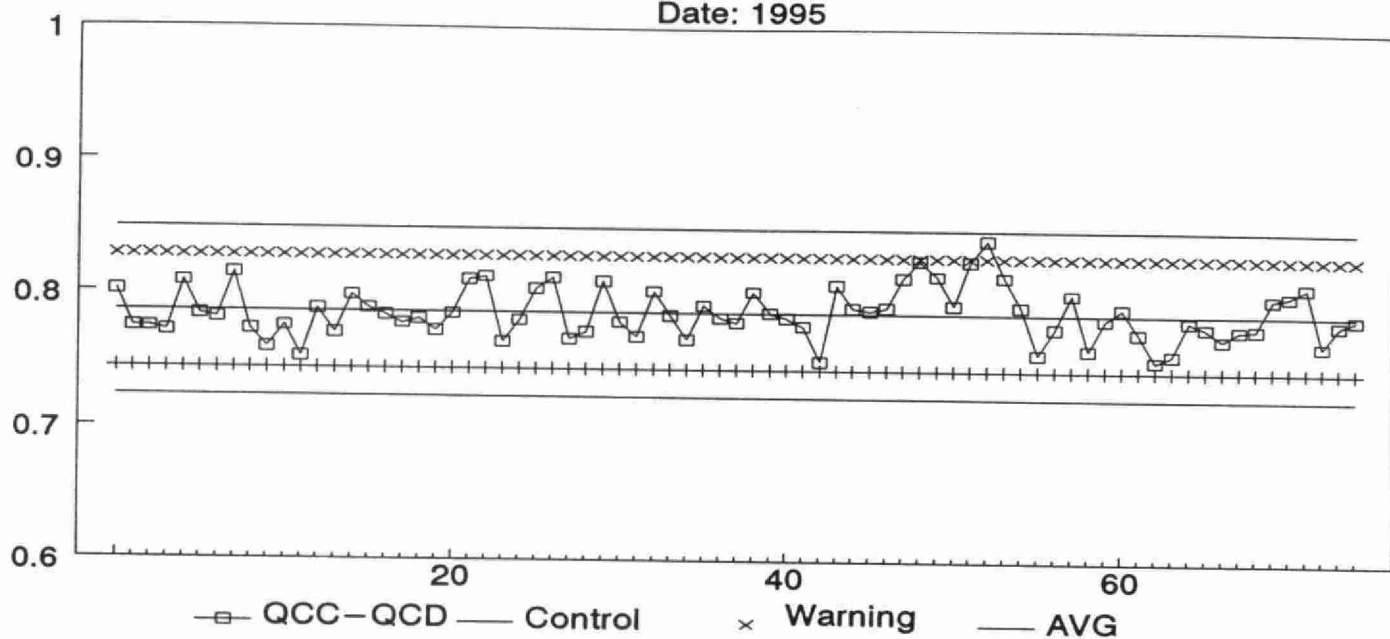
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	75	1.000	0.9777	-0.0223	0.0208
QCD:	75	0.200	0.1918	-0.0082	0.0040
QCC+QCD:	75	1.200	1.1695	-0.0305	0.0230
QCC-QCD:	75	0.800	0.7859	-0.0141	0.0210

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
81	2 - 200	5.20	1.13
n/a	200 - 2000	n/a	n/a
n/a	2000 - 15000	n/a	n/a

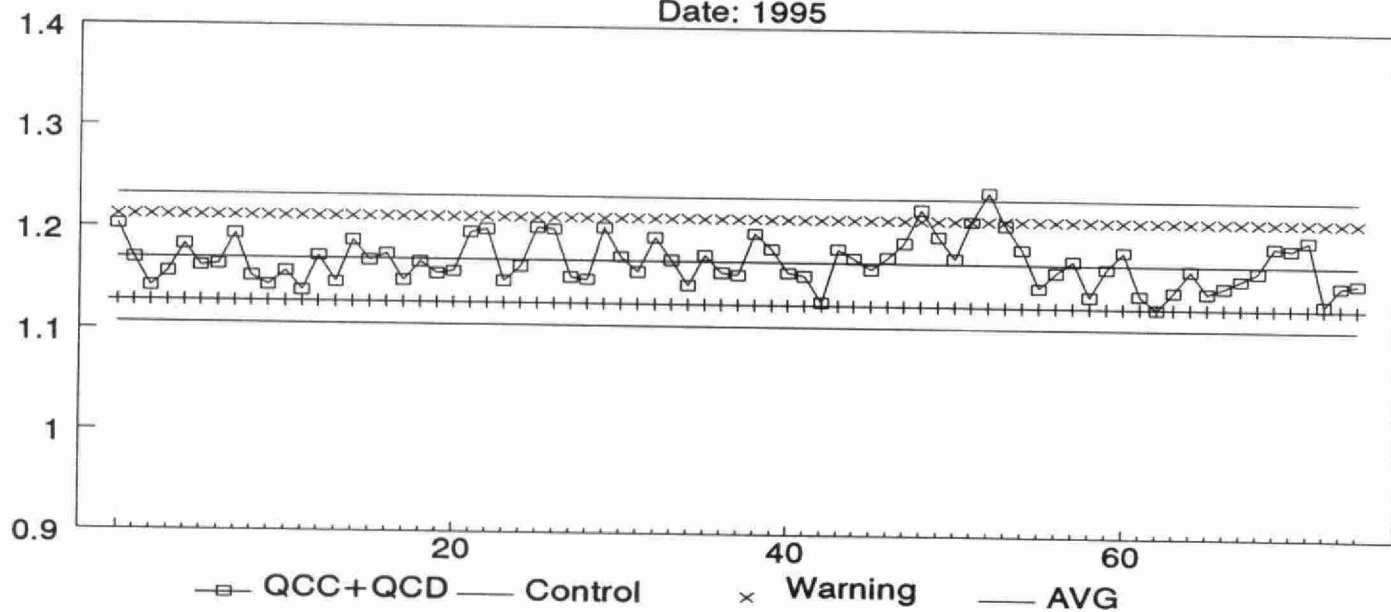
QC Difference Trades - Cd

Date: 1995



QC Sum Trades - Cd

Date: 1995



Chromium (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 5 - 15,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0467

Control Samples:

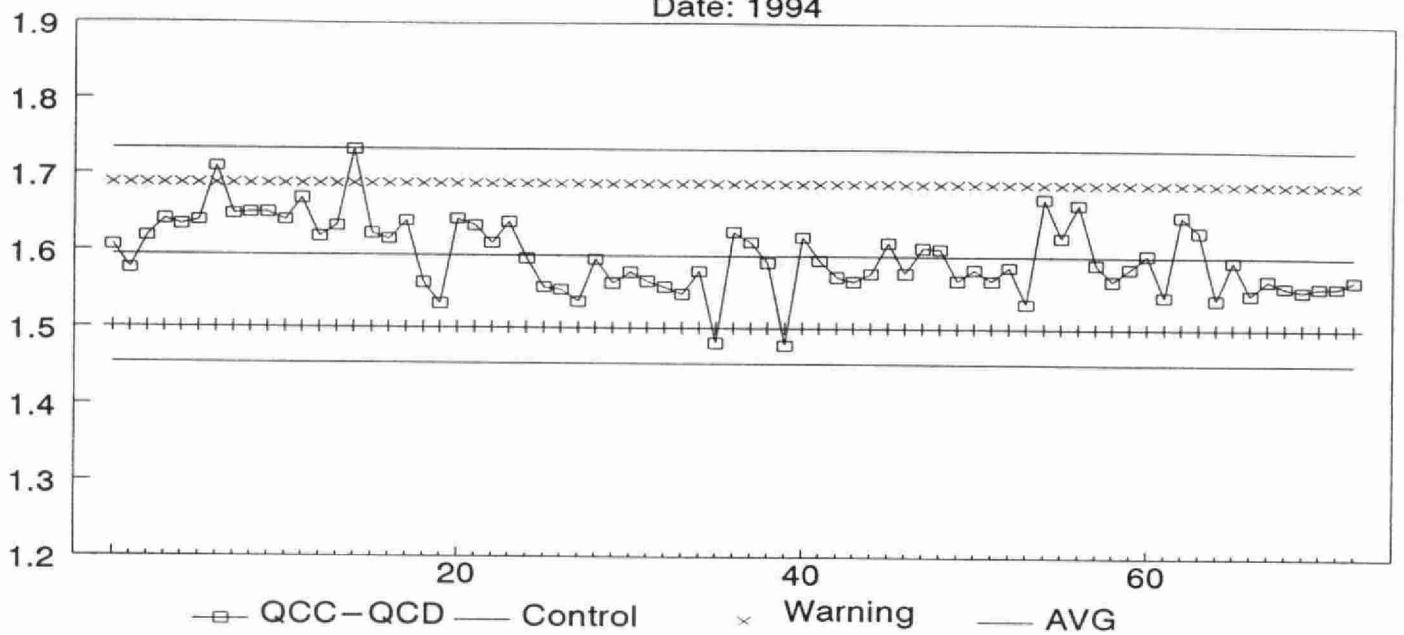
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	73	2.000	1.9903	-0.0097	0.0498
QCD:	73	0.400	0.3966	-0.0034	0.0210
QCC+QCD:	73	2.400	2.3869	-0.0131	0.0605
QCC-QCD:	73	1.600	1.5937	-0.0063	0.0467

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
70	5 - 500	7.60	1.90
n/a	500 - 5000	n/a	n/a
n/a	5000 - 15000	n/a	n/a

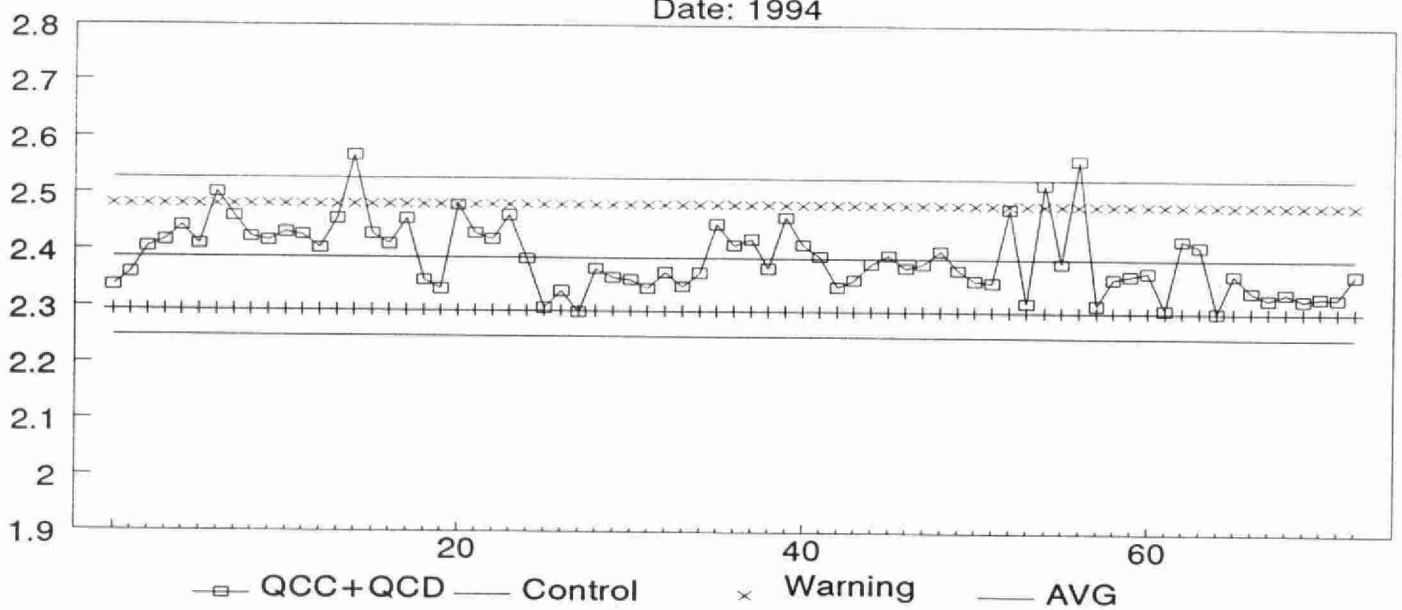
QC Difference Trades - Cr

Date: 1994



QC Sum Trades - Cr

Date: 1994



Chromium (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 5 - 15,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0359

Control Samples:

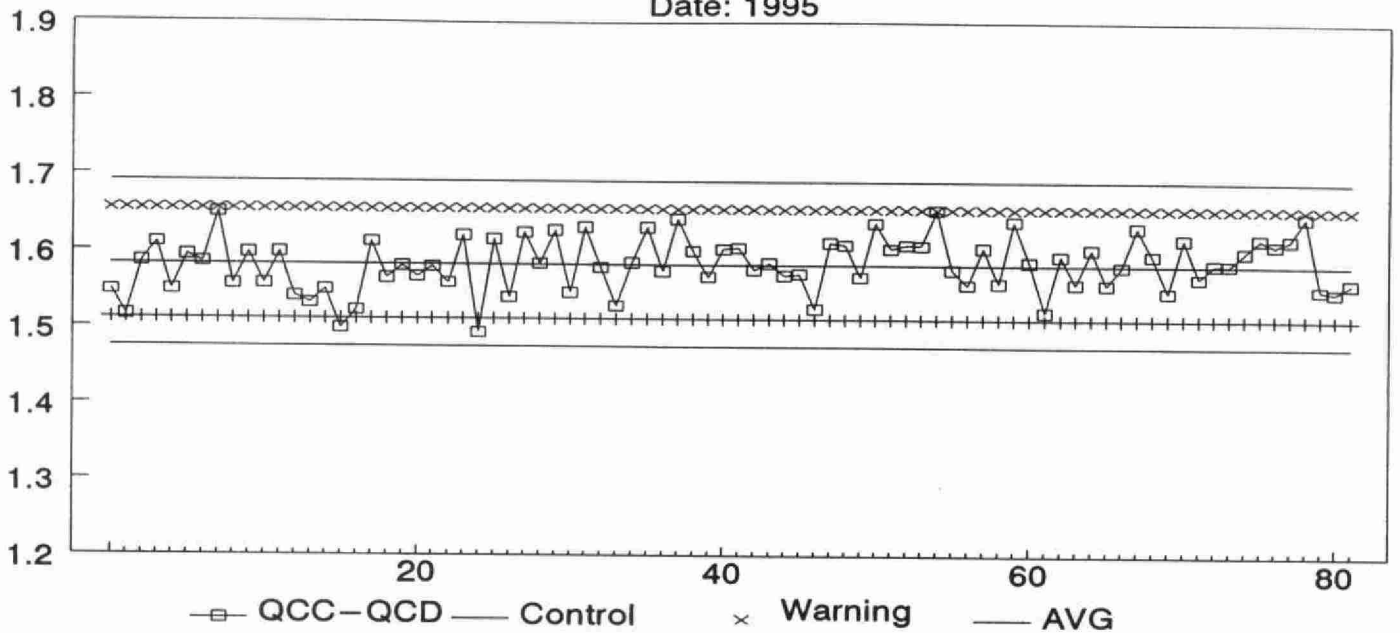
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	82	2.000	1.9749	-0.0251	0.0400
QCD:	82	0.400	0.3922	-0.0078	0.0084
QCC+QCD:	82	2.400	2.3671	-0.0329	0.0452
QCC-QCD:	82	1.600	1.5827	-0.0173	0.0359

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
79	5 - 500	8.90	1.70
n/a	500 - 5000	n/a	n/a
n/a	5000 - 15000	n/a	n/a

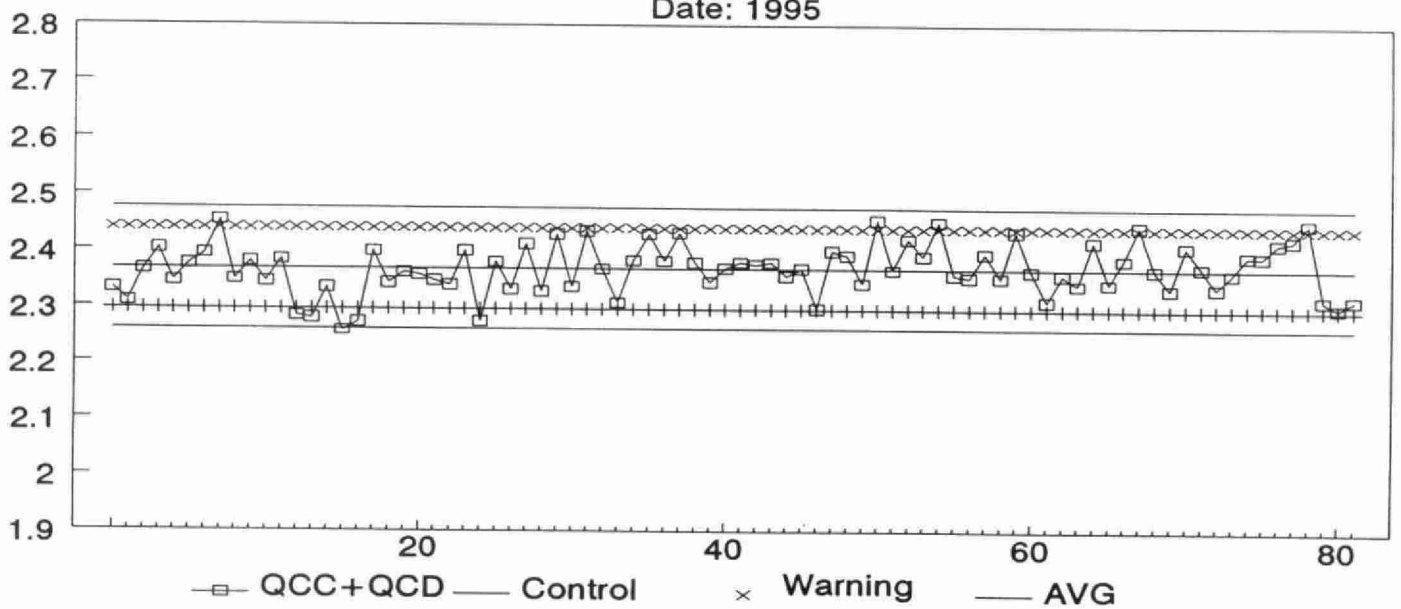
QC Difference Trades - Cr

Date: 1995



QC Sum Trades - Cr

Date: 1995



Cobalt (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 2 - 15,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0439

Control Samples:

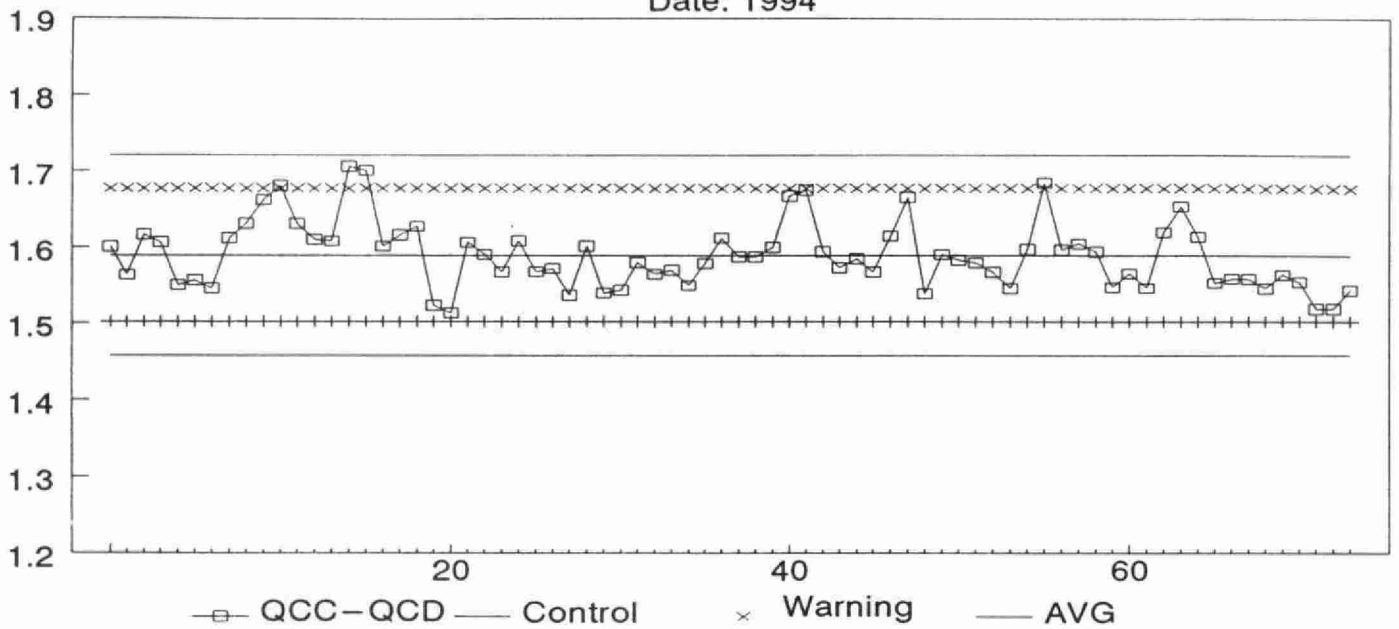
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	74	2.000	1.9786	-0.0214	0.0511
QCD:	74	0.400	0.3894	-0.0106	0.0127
QCC+QCD:	74	2.400	2.3681	-0.0319	0.0601
QCC-QCD:	74	1.600	1.5892	-0.0108	0.0439

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
71	2 - 200	7.60	1.50
n/a	200 - 2000	n/a	n/a
n/a	2000 - 15000	n/a	n/a

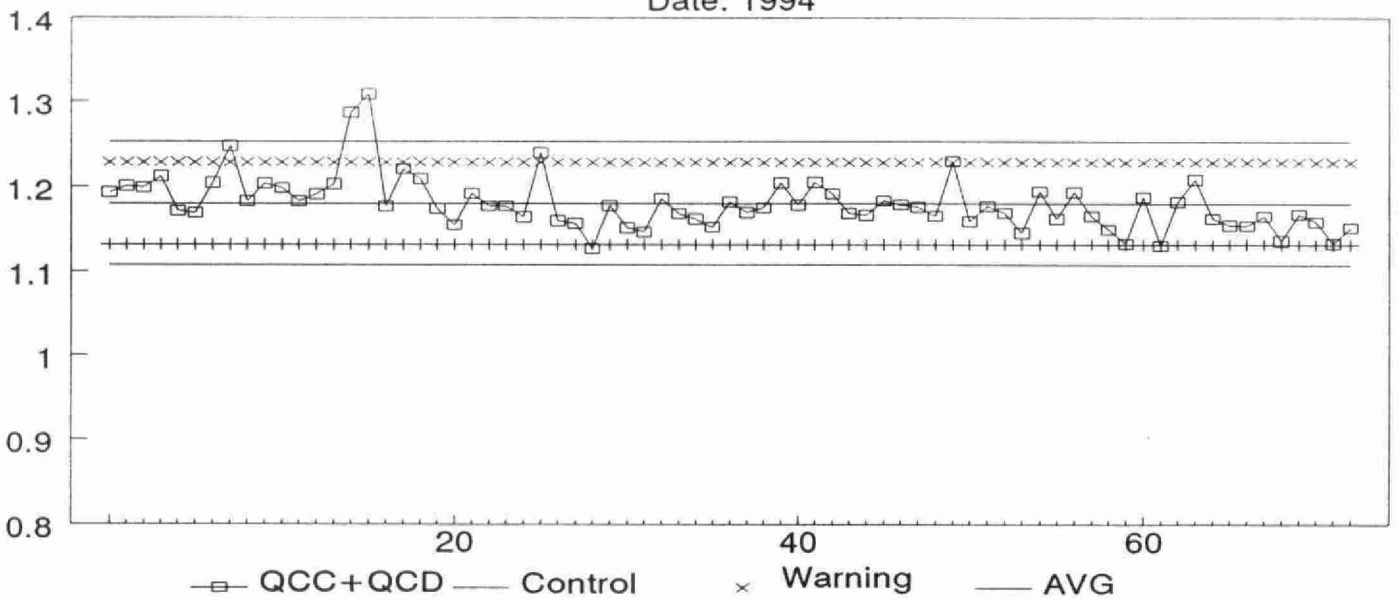
QC Difference Trades - Co

Date: 1994



QC Sum Trades - Cd

Date: 1994



Cobalt (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 2 - 15,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0438

Control Samples:

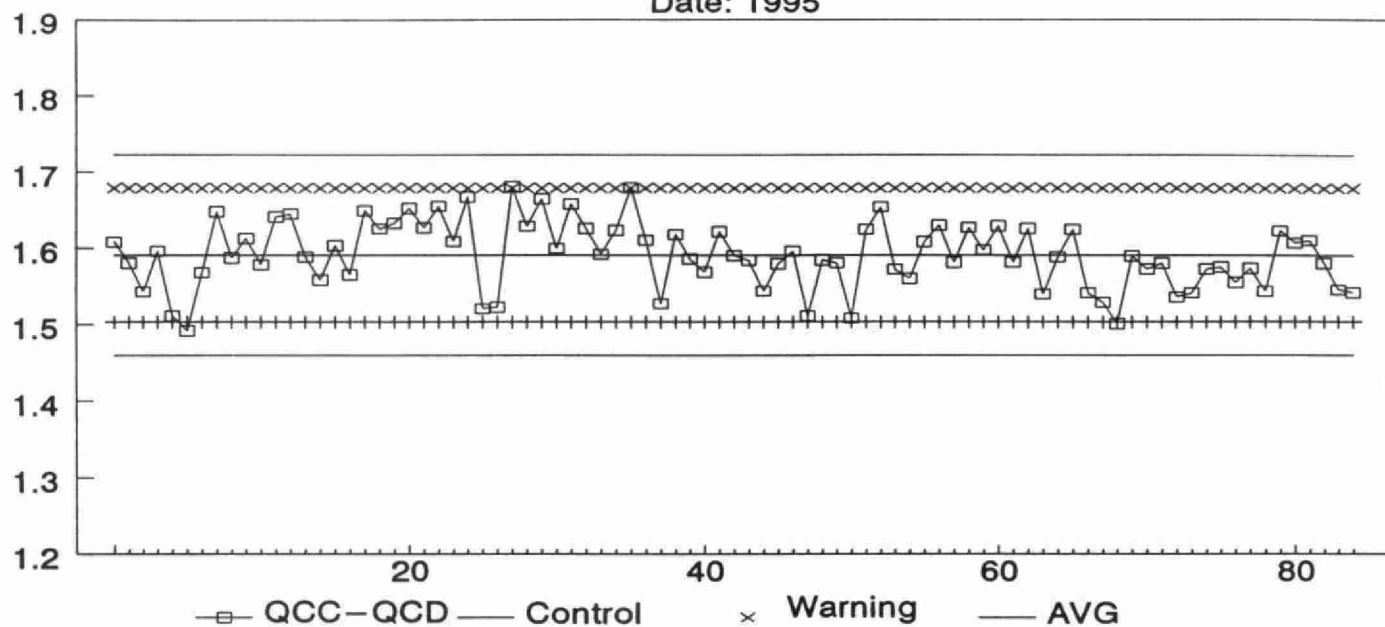
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	85	2.000	1.9813	-0.0187	0.0512
QCD:	85	0.400	0.3904	-0.0096	0.0116
QCC+QCD:	85	2.400	2.3717	-0.0283	0.0600
QCC-QCD:	85	1.600	1.5909	-0.0091	0.0438

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
76	2 - 200	15.50	1.60
n/a	200 - 2000	n/a	n/a
n/a	2000 - 15000	n/a	n/a

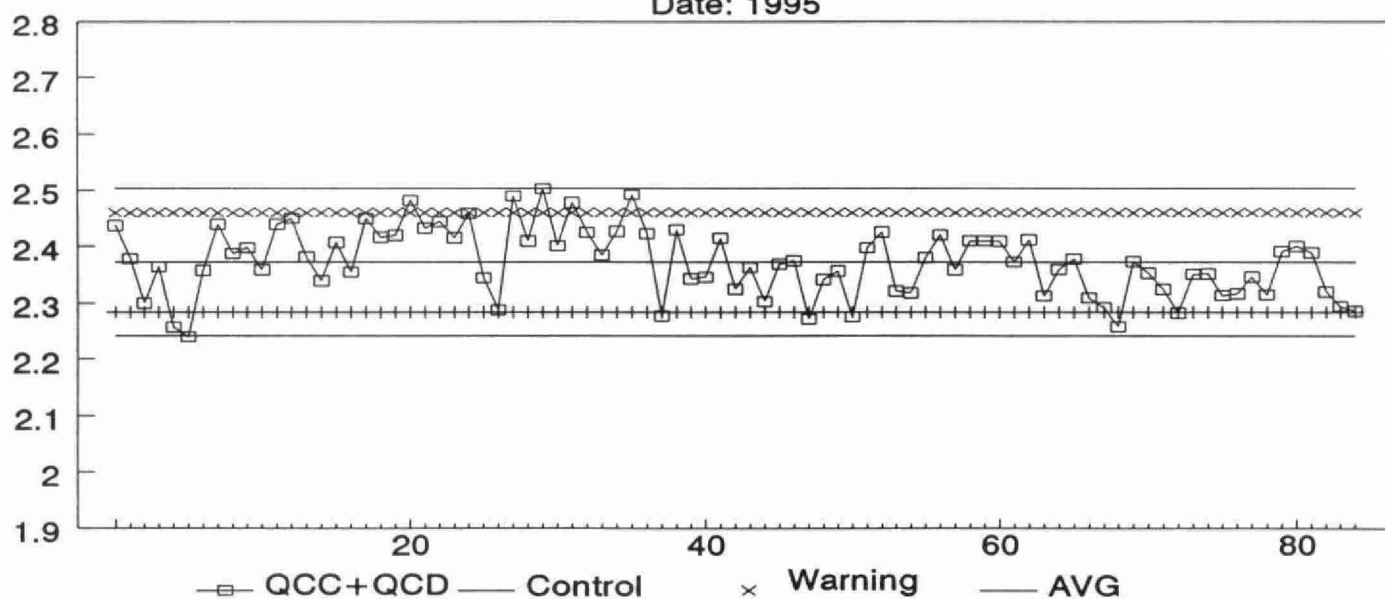
QC Difference Trades - Co

Date: 1995



QC Sum Trades - Co

Date: 1995



Copper (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 5 - 15,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0358

Control Samples:

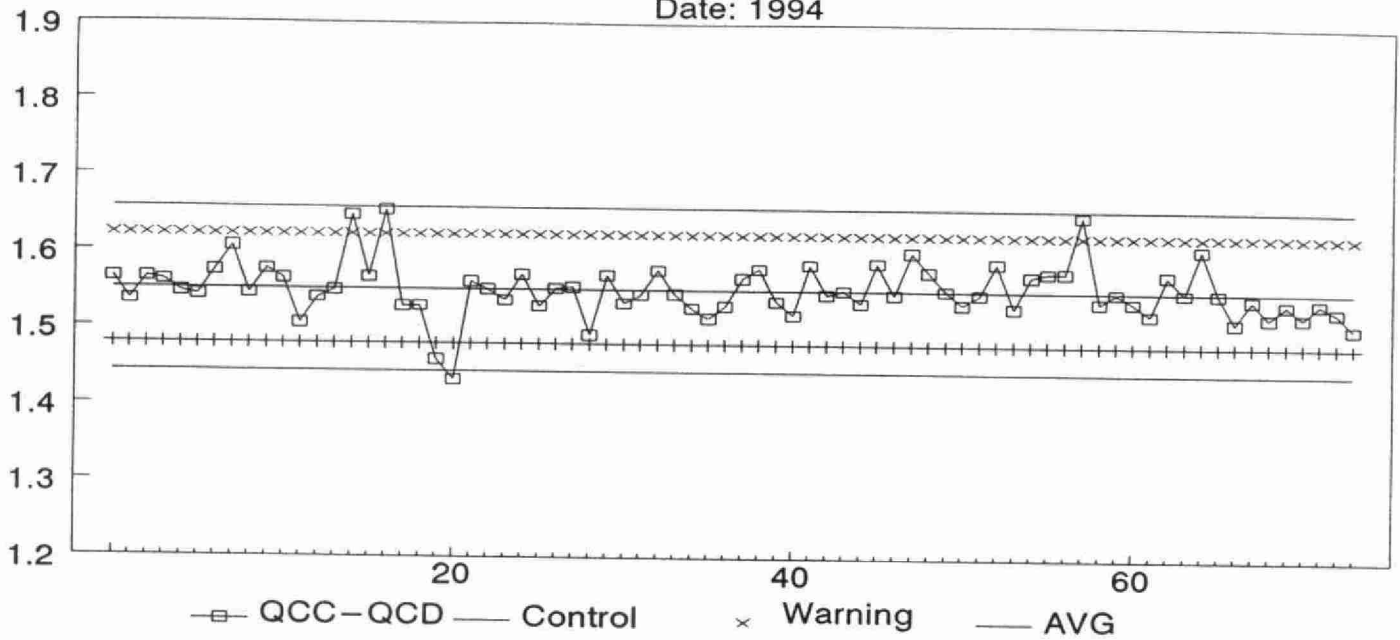
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	74	2.000	1.9364	-0.0636	0.0397
QCD:	74	0.400	0.3863	-0.0137	0.0107
QCC+QCD:	74	2.400	2.3227	-0.0773	0.0458
QCC-QCD:	74	1.600	1.5501	-0.0499	0.0358

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
62	5 - 500	33.00	2.80
n/a	500 - 5000	n/a	n/a
n/a	5000 - 15000	n/a	n/a

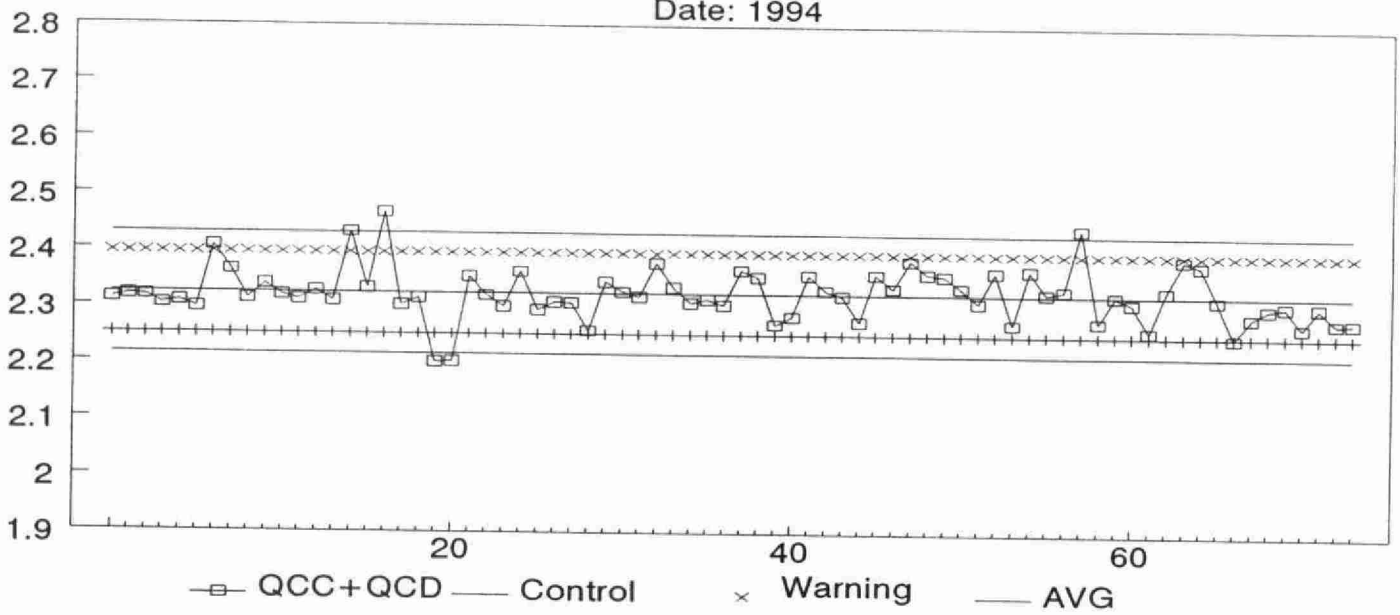
QC Difference Trades - Cu

Date: 1994



QC Sum Trades - Cu

Date: 1994



Copper (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 5 - 15,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0358

Control Samples:

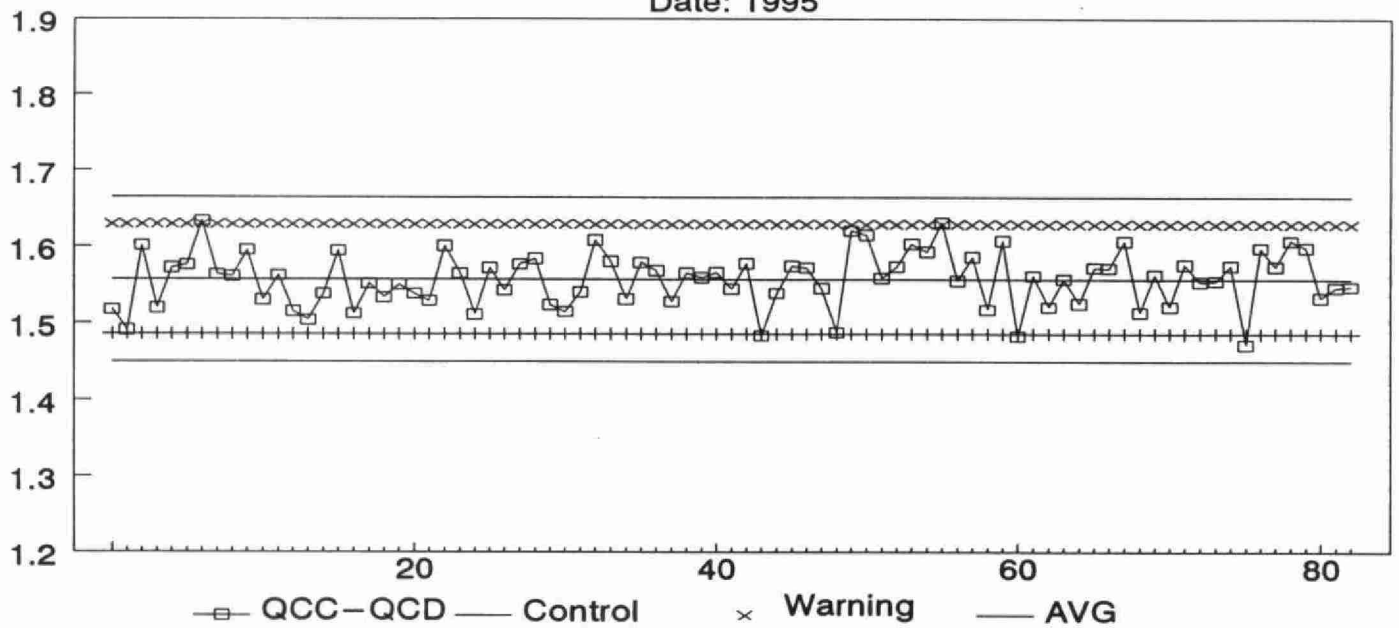
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	83	2.000	1.9426	-0.0574	0.0395
QCD:	83	0.400	0.3855	-0.0145	0.0083
QCC+QCD:	83	2.400	2.3281	-0.0719	0.0444
QCC-QCD:	83	1.600	1.5570	-0.0430	0.0358

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
76	5 - 500	12.10	1.80
n/a	500 - 5000	n/a	n/a
n/a	5000 - 15000	n/a	n/a

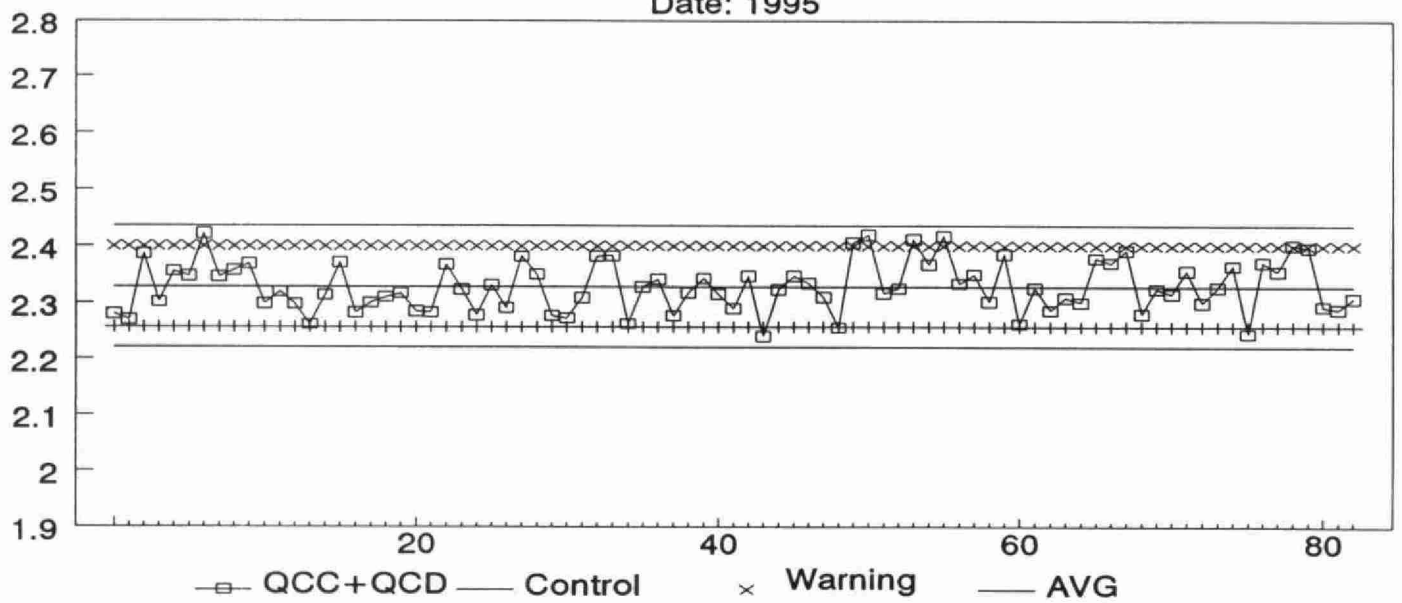
QC Difference Trades - Cu

Date: 1995



QC Sum Trades - Cu

Date: 1995



Iron (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 50 - 150,000 ug/L

Detection Limit (W): 50 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.1744

Control Samples:

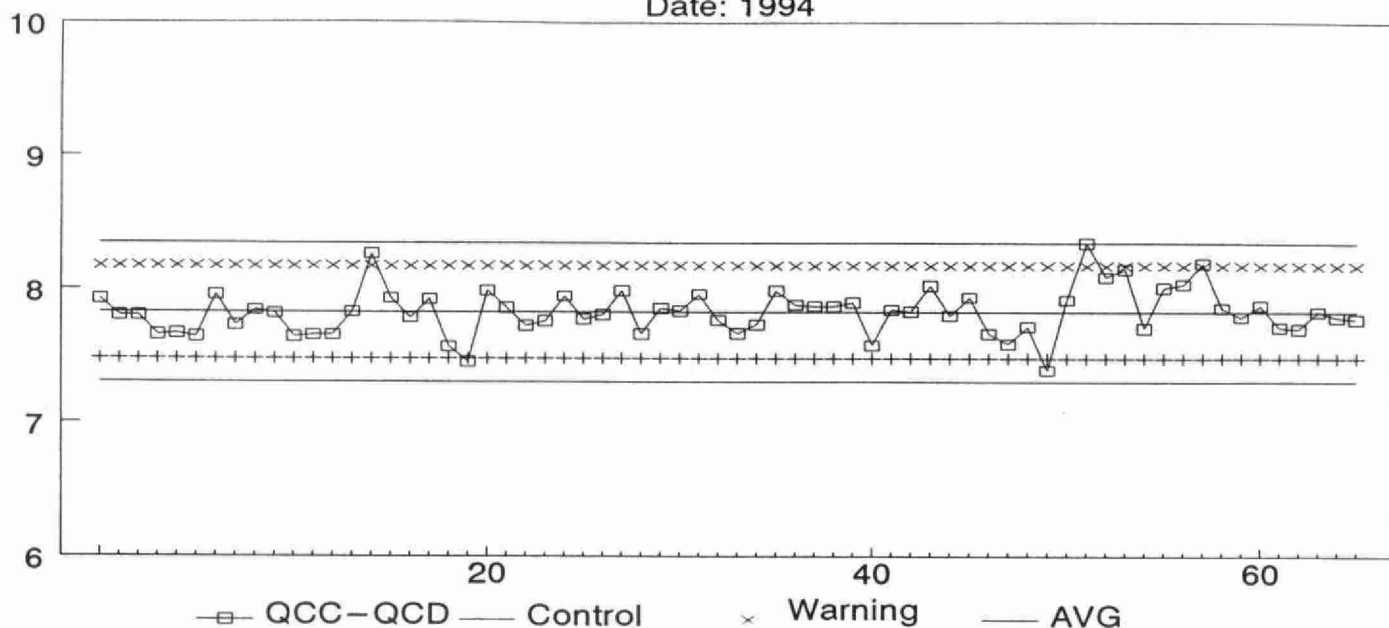
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	66	10.000	9.7978	-0.2022	0.1801
QCD:	66	2.000	1.9715	-0.0285	0.0681
QCC+QCD:	66	12.000	11.7693	-0.2307	0.2091
QCC-QCD:	66	8.000	7.8263	-0.1737	0.1744

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
47	50 - 5000	960.00	36.00
9	5000 - 50000	24000	440
n/a	50000 - 150000	n/a	n/a

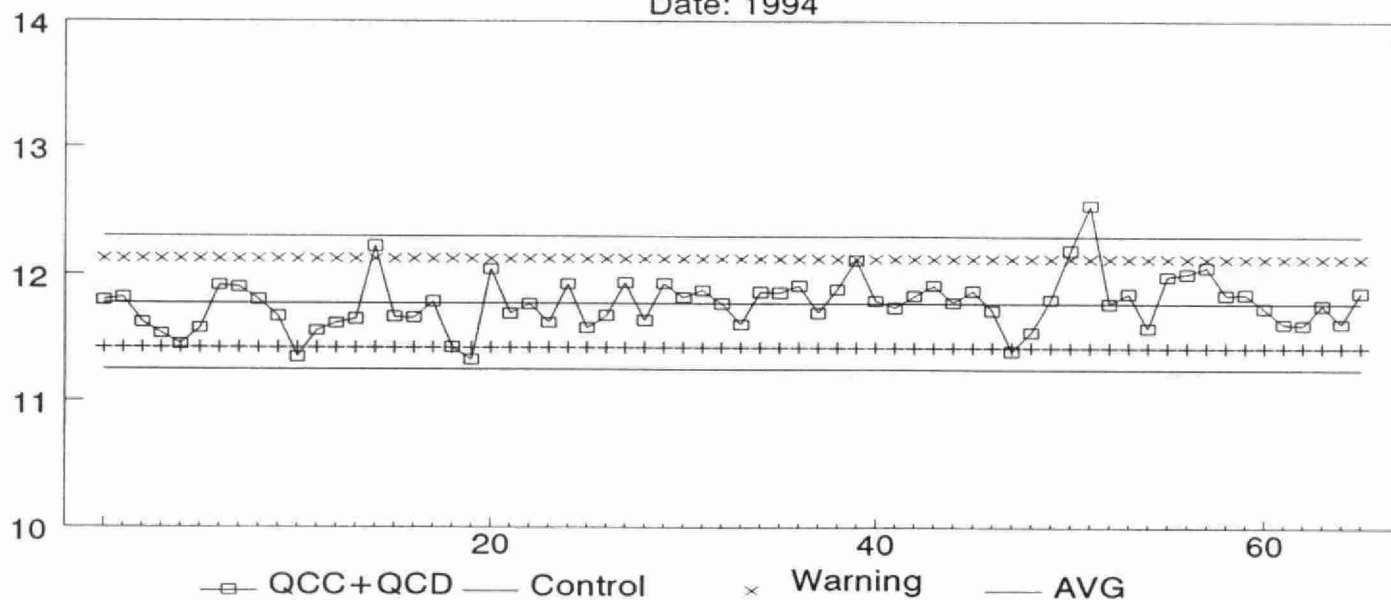
QC Difference Trades - Fe

Date: 1994



QC Sum Trades - Fe

Date: 1994



Iron (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 50 - 150,000 ug/L

Detection Limit (W): 50 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.1480

Control Samples:

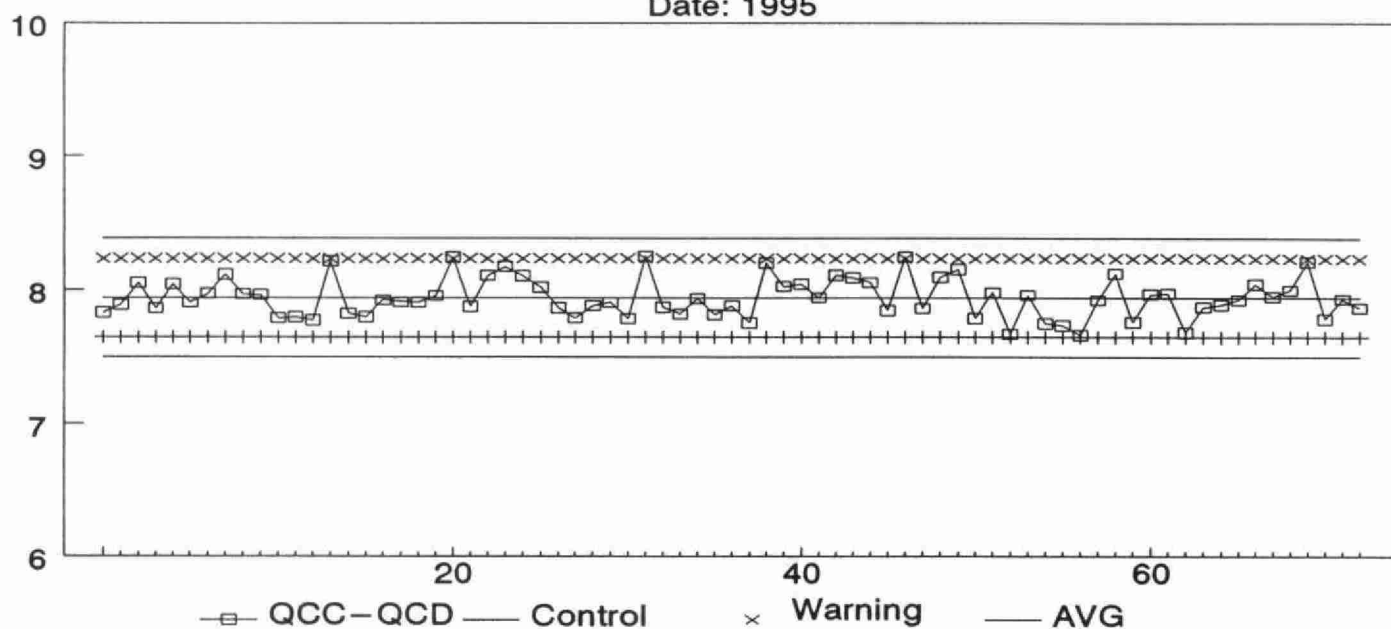
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	73	10.000	9.9078	-0.0922	0.1641
QCD:	73	2.000	1.9667	-0.0333	0.0554
QCC+QCD:	73	12.000	11.8745	-0.1255	0.1952
QCC-QCD:	73	8.000	7.9412	-0.0588	0.1480

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
59	50 - 5000	819.00	28.00
10	5000 - 50000	20000	380
n/a	50000 - 150000	n/a	n/a

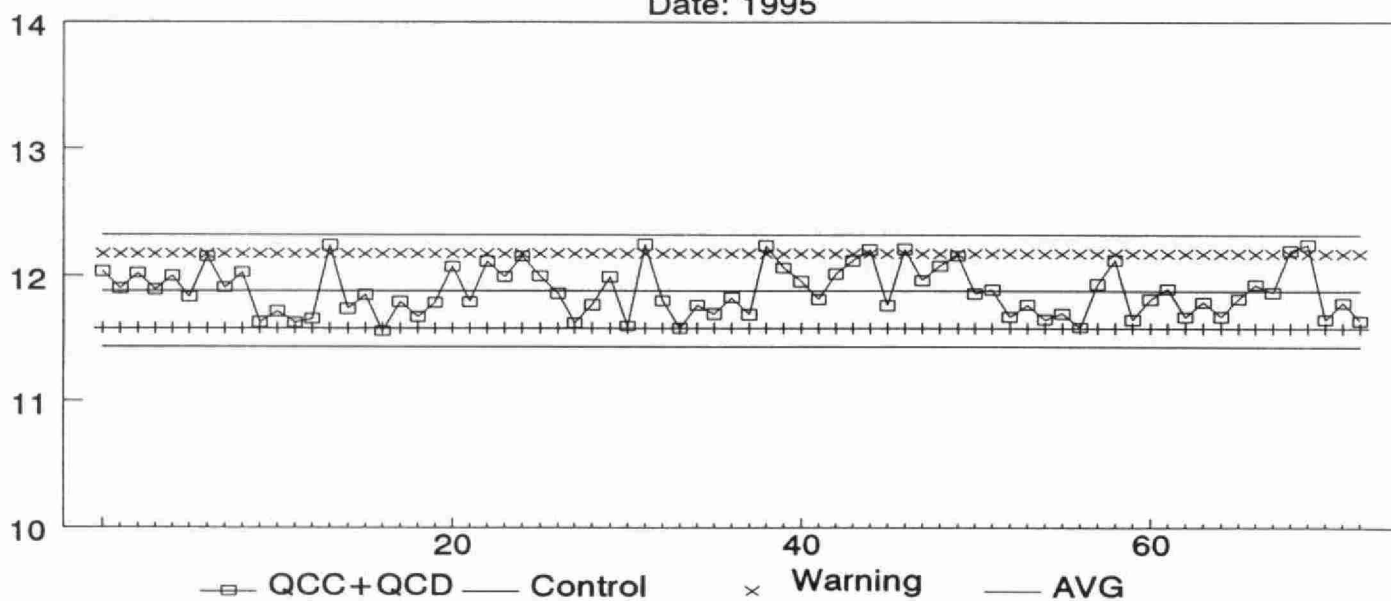
QC Difference Trades - Fe

Date: 1995



QC Sum Trades - Fe

Date: 1995



Lead (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 20 - 20,000 ug/L

Detection Limit (W): 20 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0573

Control Samples:

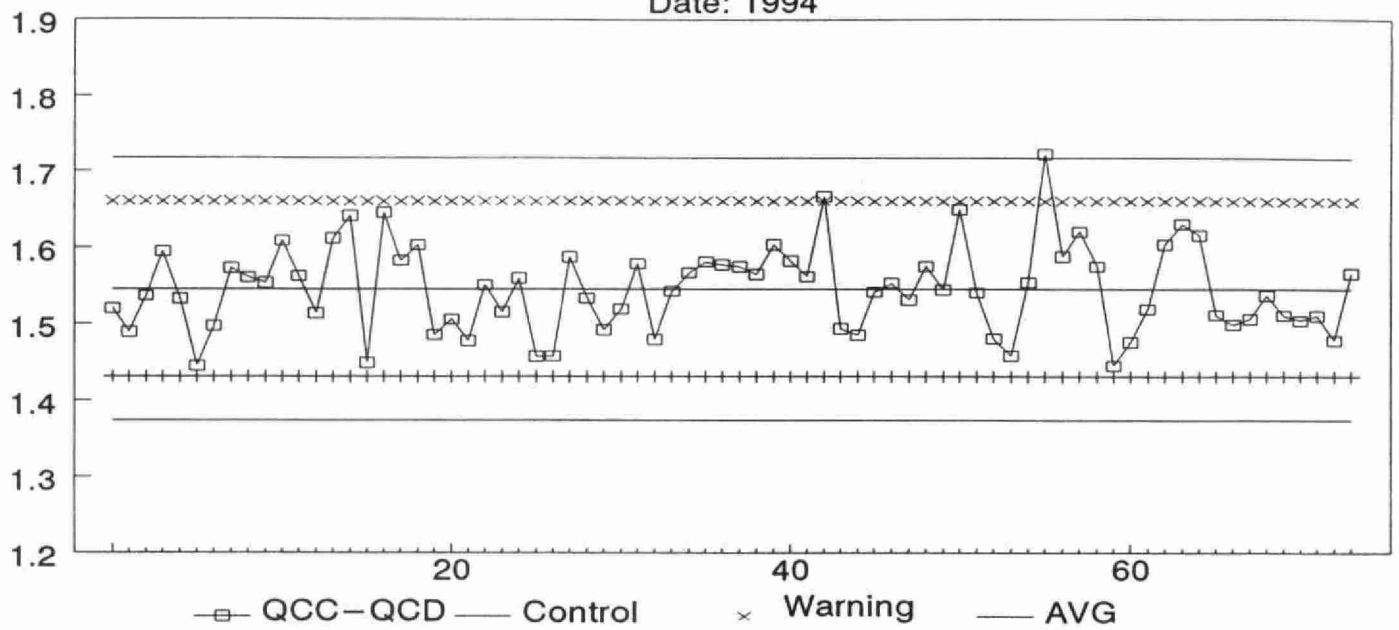
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	74	2.000	1.9267	-0.0733	0.0642
QCD:	74	0.400	0.3812	-0.0188	0.0332
QCC+QCD:	74	2.400	2.3079	-0.0921	0.0846
QCC-QCD:	74	1.600	1.5455	-0.0545	0.0573

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
62	20 - 2000	9.80	8.80
n/a	2000 - 20000	n/a	n/a

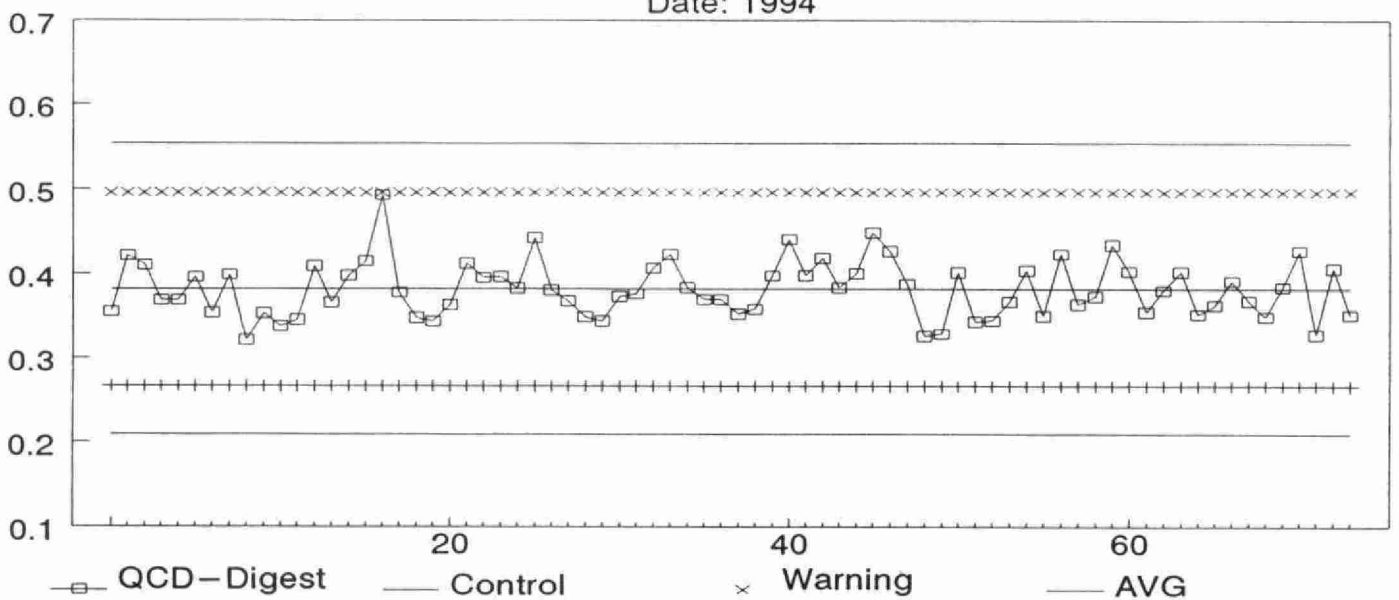
QC Difference Trades - Pb

Date: 1994



QCD Trades - Pb

Date: 1994



Lead (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 20 - 20,000 ug/L

Detection Limit (W): 20 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0466

Control Samples:

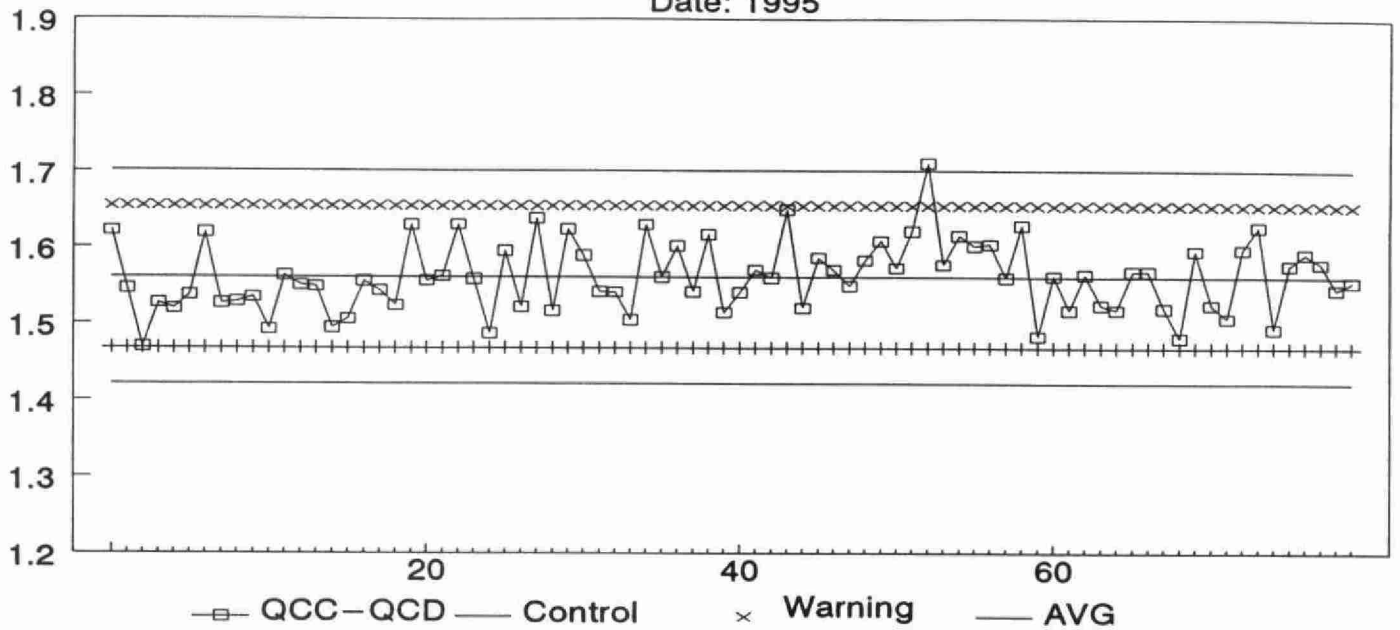
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	80	2.000	1.9456	-0.0544	0.0503
QCD:	80	0.400	0.3847	-0.0153	0.0220
QCC+QCD:	80	2.400	2.3303	-0.0697	0.0620
QCC-QCD:	80	1.600	1.5609	-0.0391	0.0466

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
81	20 - 2000	47.00	9.80
n/a	2000 - 20000	n/a	n/a

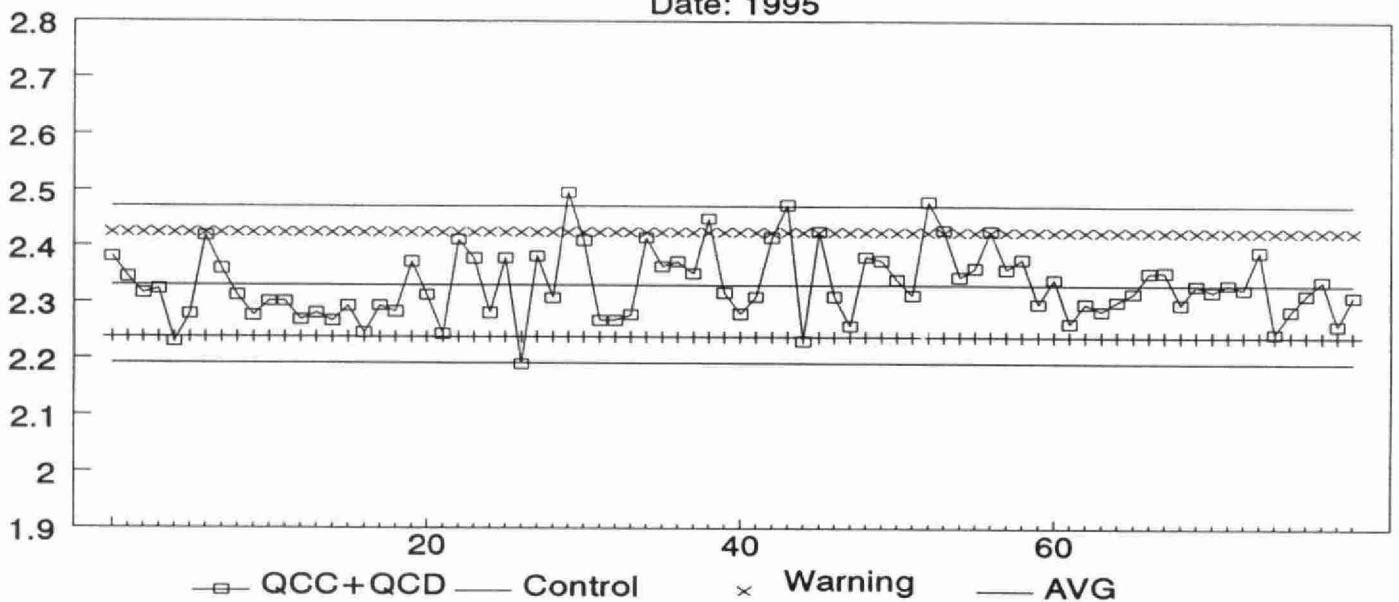
QC Difference Trades – Pb

Date: 1995



QC Sum Trades – Pb

Date: 1995



Manganese (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 2 - 15,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0372

Control Samples:

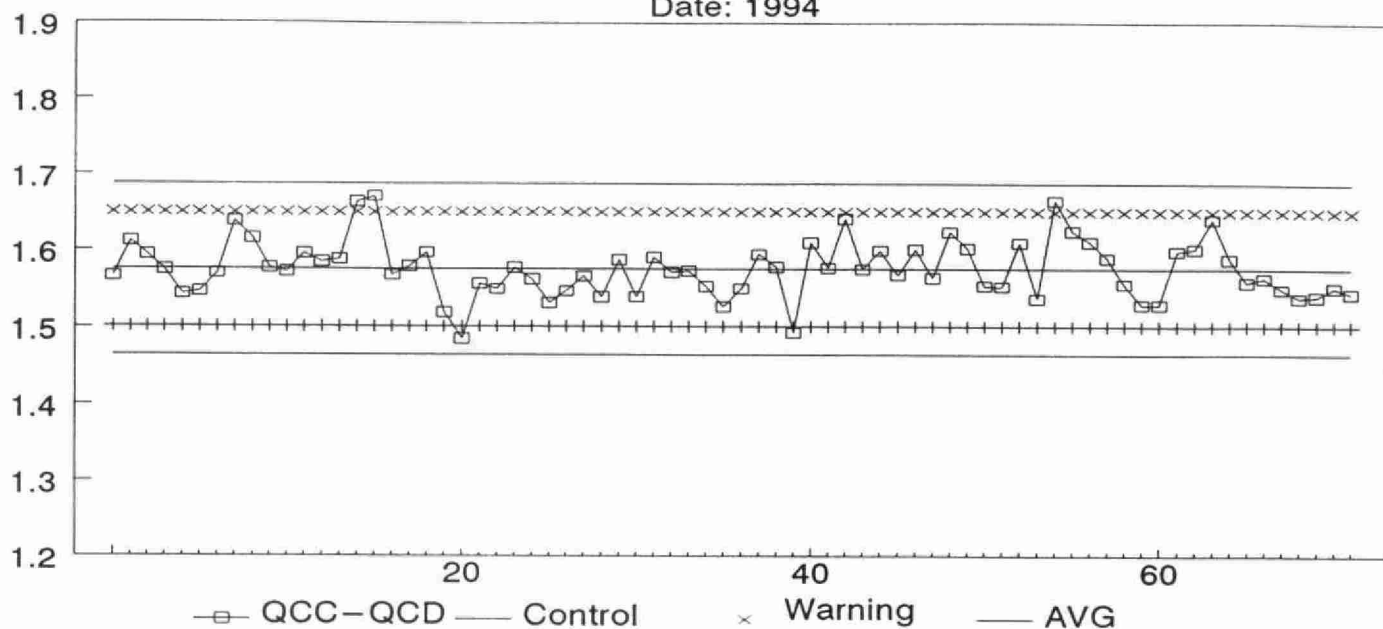
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	72	2.000	1.9625	-0.0375	0.0340
QCD:	72	0.400	0.3870	-0.0130	0.0155
QCC+QCD:	72	2.400	2.3496	-0.0504	0.0375
QCC-QCD:	72	1.600	1.5755	-0.0245	0.0372

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
36	2 - 200	48.00	1.40
22	200 - 2000	770.00	8.2
8	2000 - 20000	4700.00	59

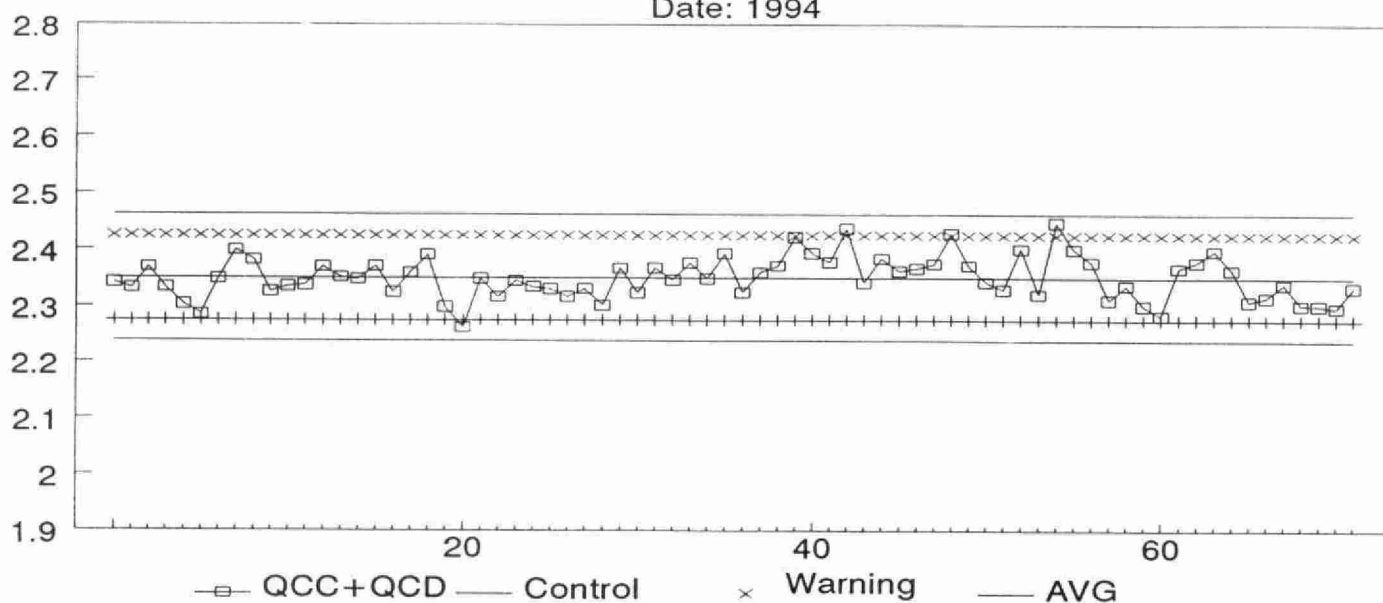
QC Difference Trades - Mn

Date: 1994



QC Sum Trades - Mn

Date: 1994



Manganese (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 2 - 15,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0382

Control Samples:

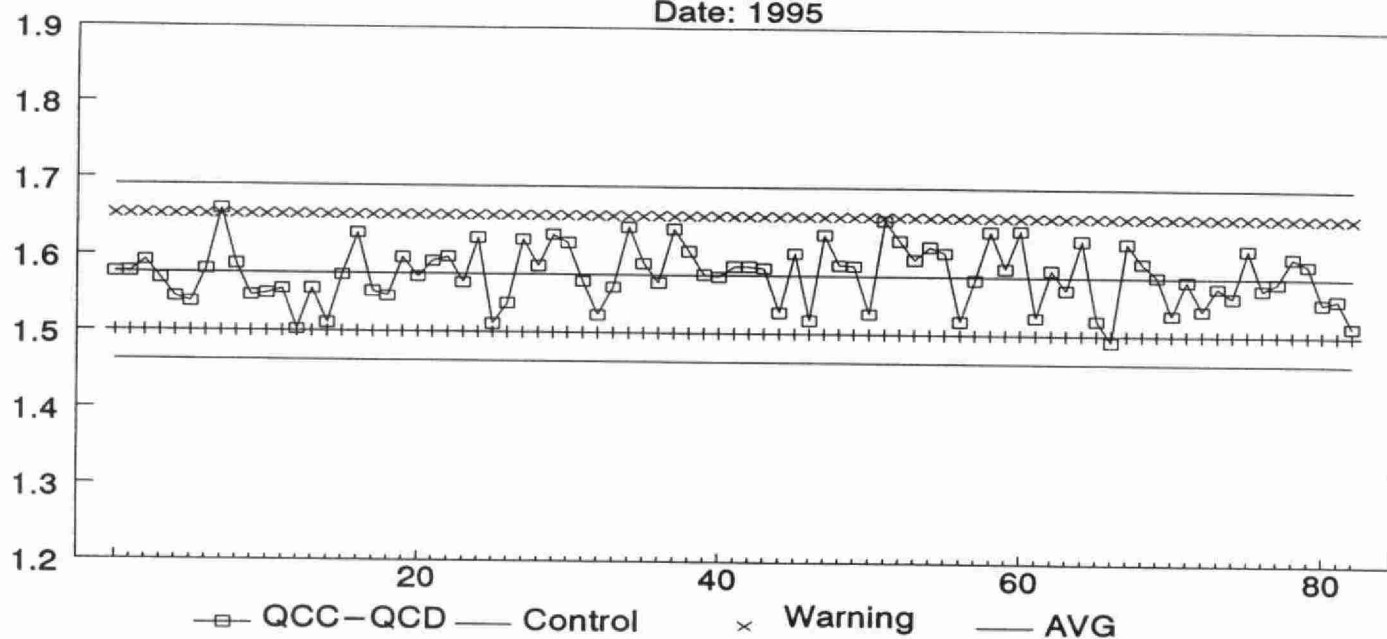
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	83	2.000	1.9619	-0.0381	0.0427
QCD:	83	0.400	0.3856	-0.0144	0.0079
QCC+QCD:	83	2.400	2.3476	-0.0524	0.0481
QCC-QCD:	83	1.600	1.5763	-0.0237	0.0382

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
49	2 - 200	37.00	1.20
15	200 - 2000	908.00	11.1
9	2000 - 20000	4600.00	82

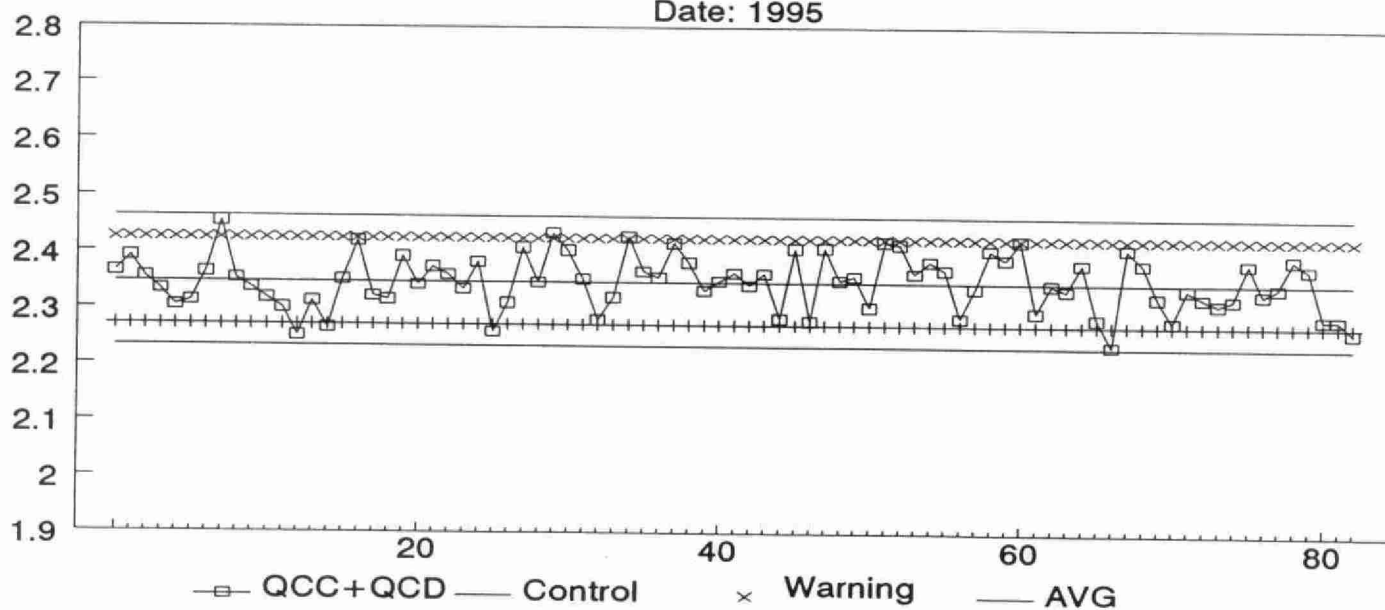
QC Difference Trades - Mn

Date: 1995



QC Sum Trades - Mn

Date: 1995



Molybdenum (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 5 - 20,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0386

Control Samples:

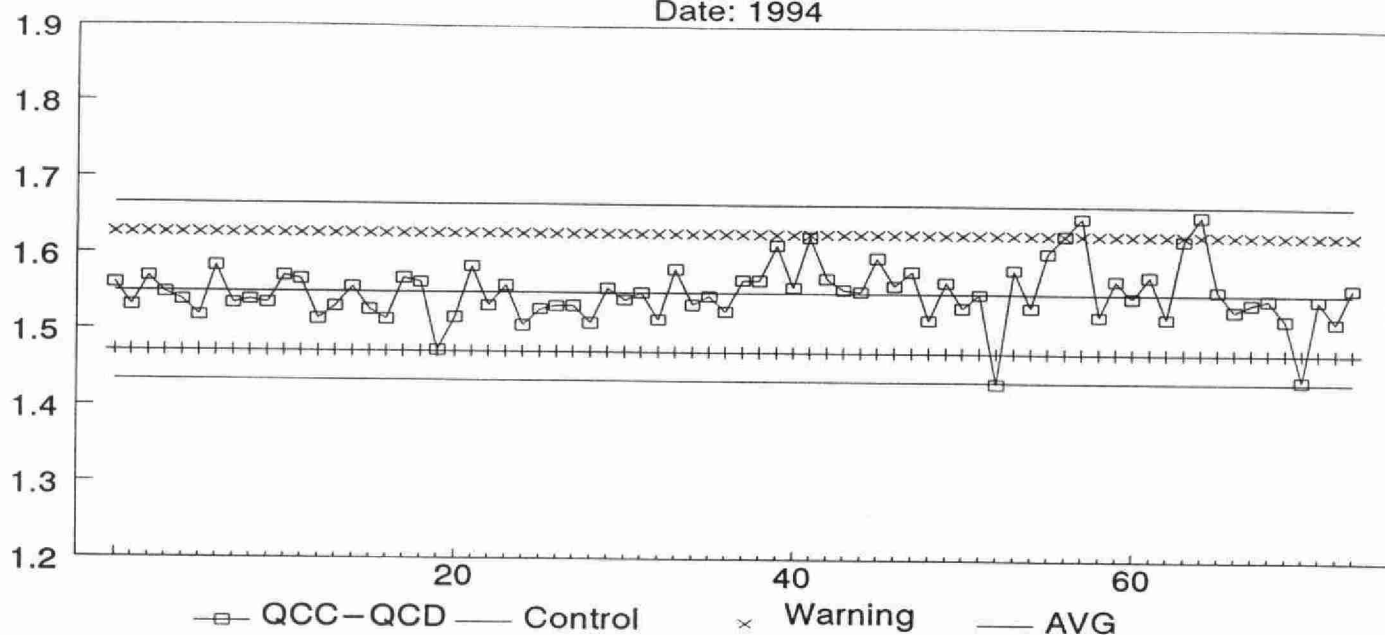
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	74	2.000	1.9343	-0.0657	0.0425
QCD:	74	0.400	0.3852	-0.0148	0.0104
QCC+QCD:	74	2.400	2.3195	-0.0805	0.0483
QCC-QCD:	74	1.600	1.5491	-0.0509	0.0386

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
62	5 - 500	4.10	1.10
n/a	500 - 5000	n/a	n/a
n/a	5000 - 20000	n/a	n/a

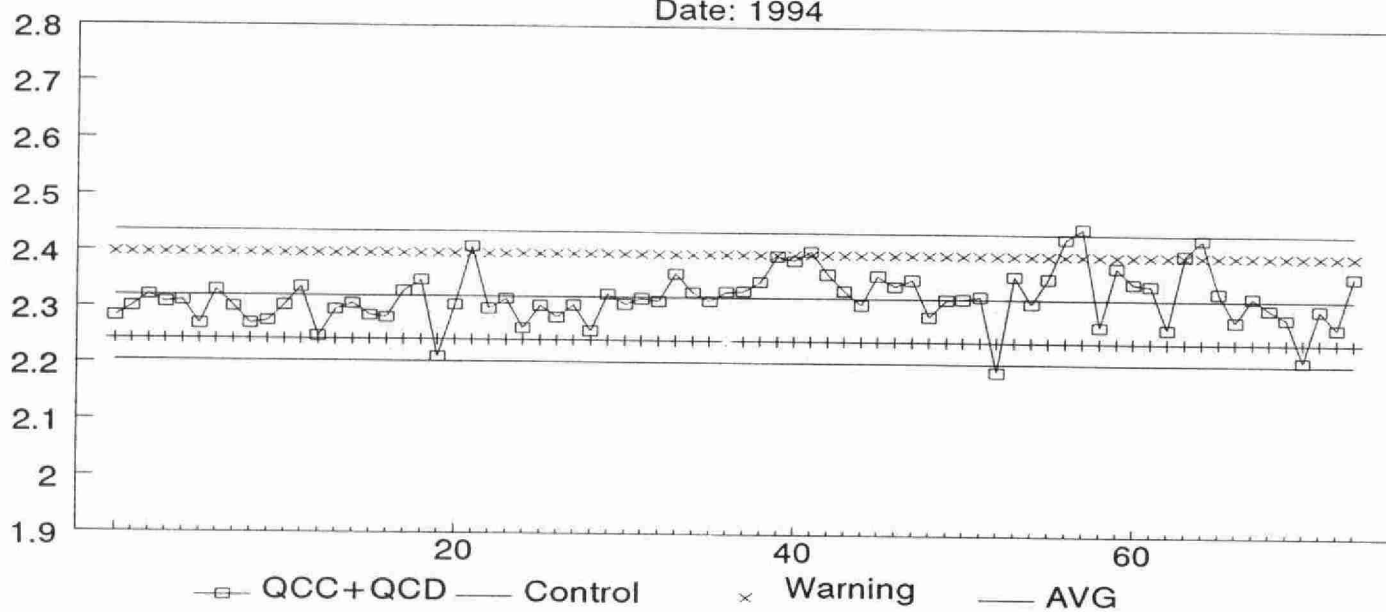
QC Difference Trades - Mo

Date: 1994



QC Sum Trades - Mo

Date: 1994



Molybdenum (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 5 - 20,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0404

Control Samples:

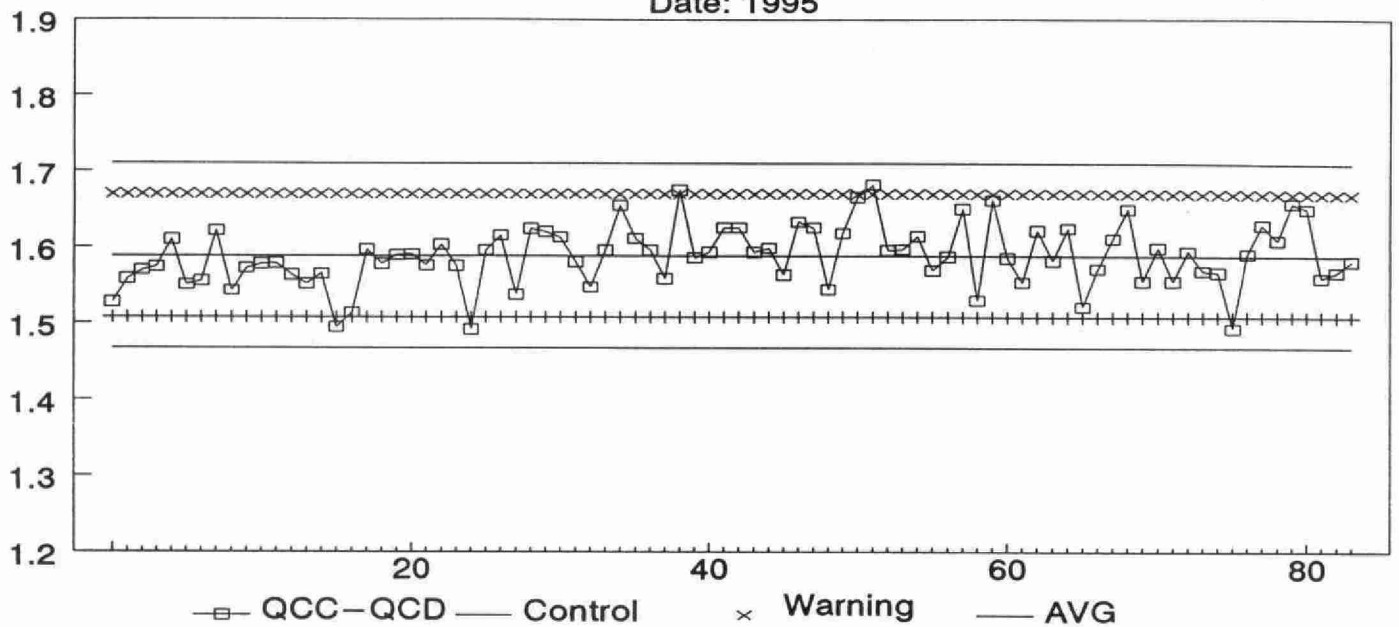
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	84	2.000	1.9796	-0.0204	0.0447
QCD:	84	0.400	0.3911	-0.0089	0.0092
QCC+QCD:	84	2.400	2.3707	-0.0293	0.0504
QCC-QCD:	84	1.600	1.5885	-0.0115	0.0404

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
79	5 - 500	16.70	1.40
n/a	500 - 5000	n/a	n/a
n/a	5000 - 20000	n/a	n/a

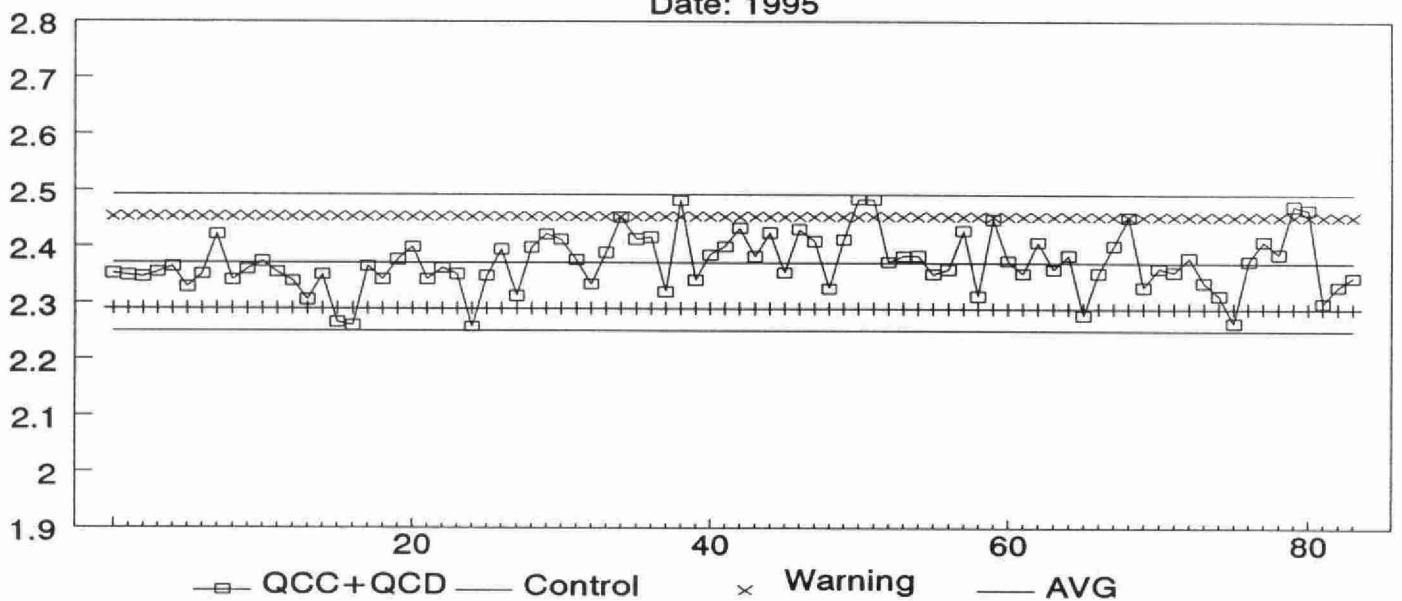
QC Difference Trades - Mo

Date: 1995



QC Sum Trades - Mo

Date: 1995



Nickel (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 5 - 20,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0399

Control Samples:

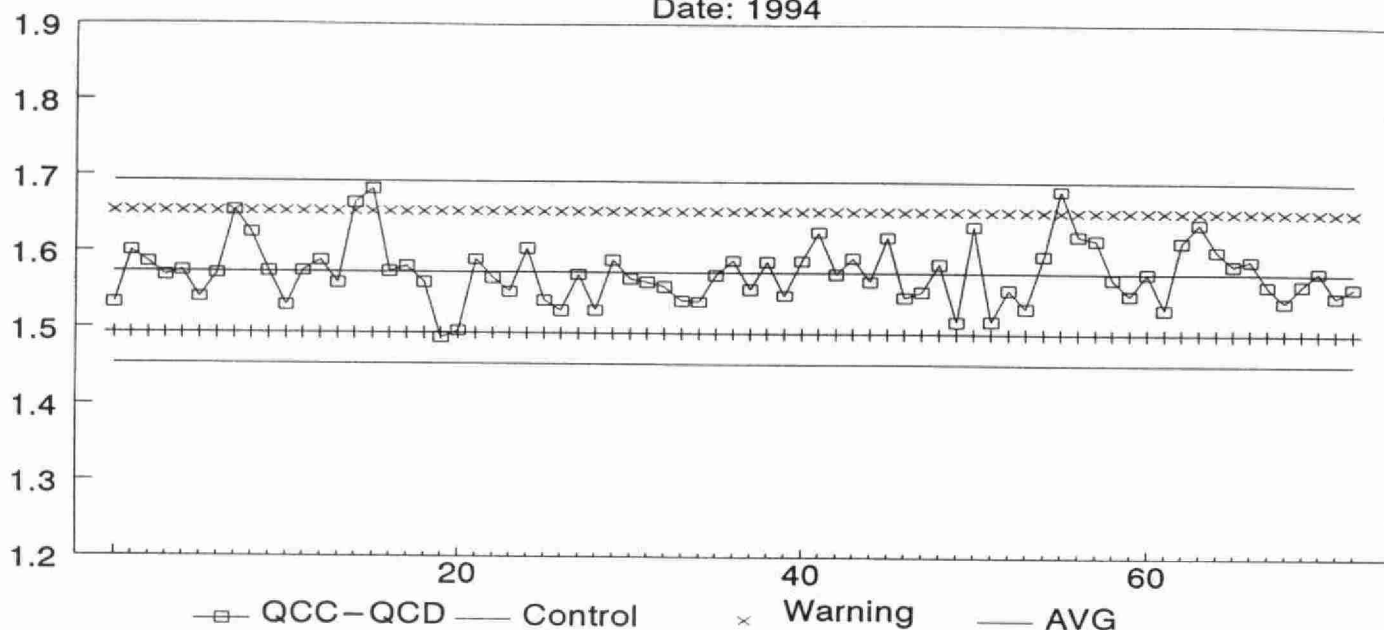
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	73	2.000	1.9609	-0.0391	0.0452
QCD:	73	0.400	0.3882	-0.0118	0.0132
QCC+QCD:	73	2.400	2.3491	-0.0509	0.0533
QCC-QCD:	73	1.600	1.5727	-0.0273	0.0399

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
57	5 - 500	37.00	2.50
n/a	500 - 5000	n/a	n/a
n/a	5000 - 20000	n/a	n/a

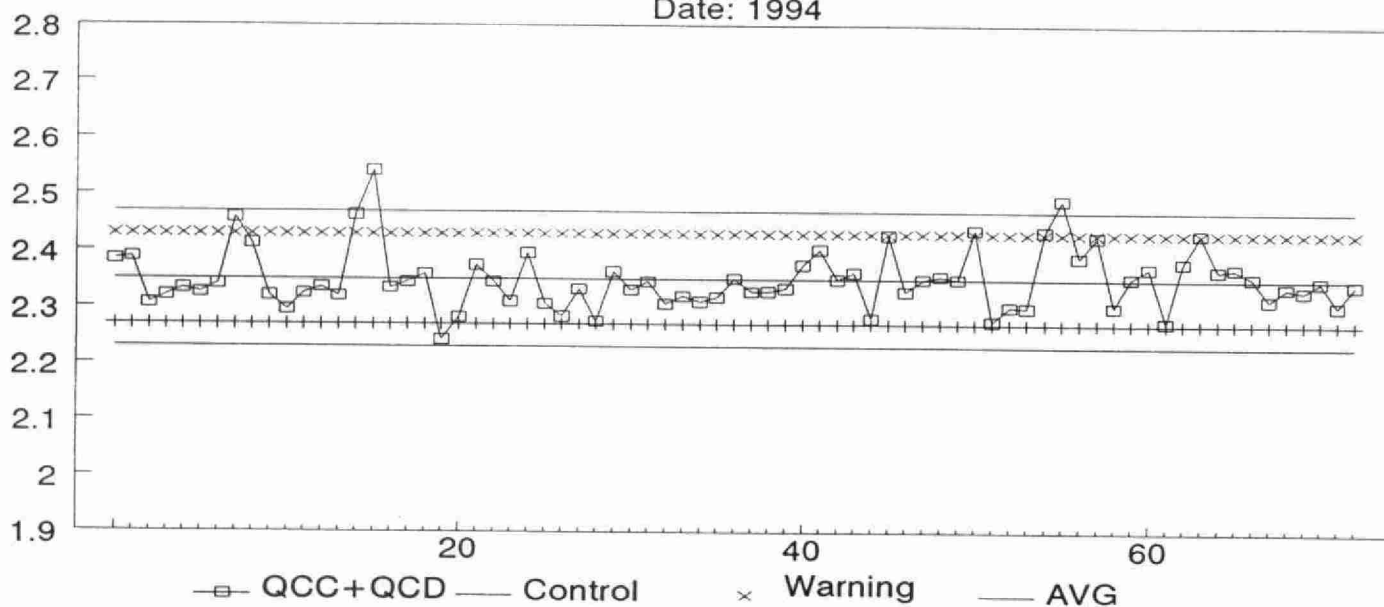
QC Difference Trades - Ni

Date: 1994



QC Sum Trades - Ni

Date: 1994



Nickel (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 5 - 20,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0427

Control Samples:

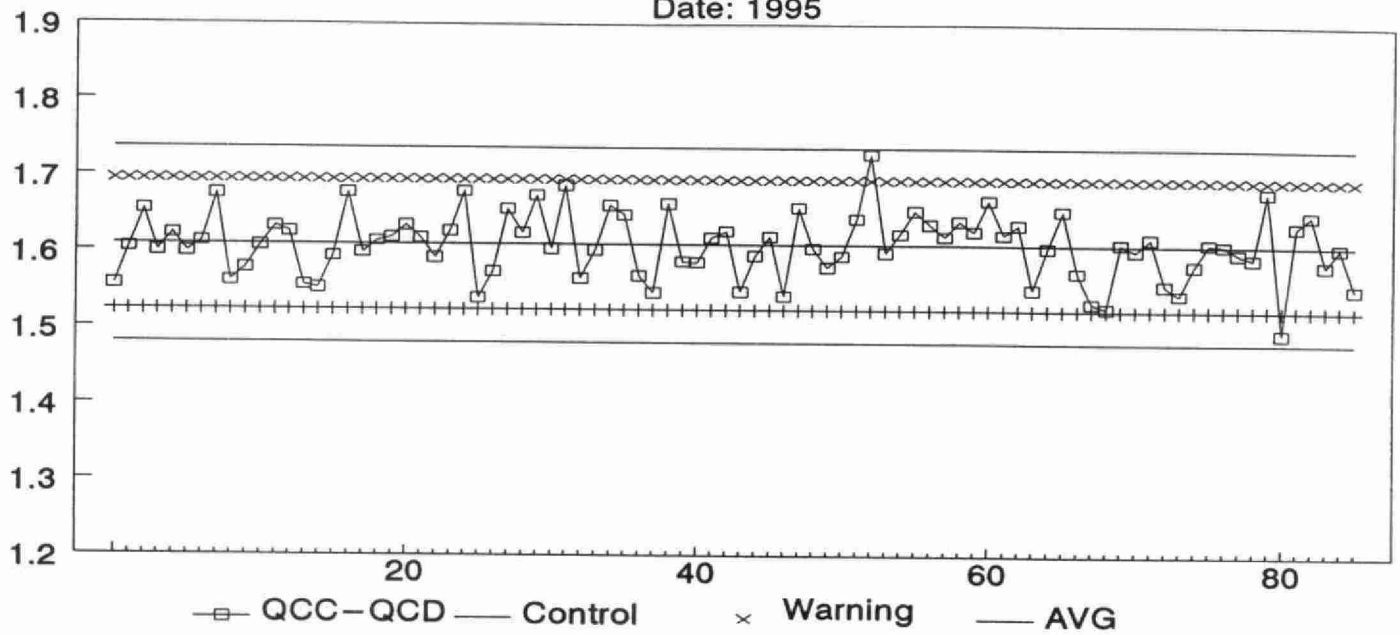
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	86	2.000	2.0032	0.0032	0.0476
QCD:	86	0.400	0.3954	-0.0046	0.0150
QCC+QCD:	86	2.400	2.3986	-0.0014	0.0563
QCC-QCD:	86	1.600	1.6078	0.0078	0.0427

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
79	5 - 500	29.10	2.70
n/a	500 - 5000	n/a	n/a
n/a	5000 - 20000	n/a	n/a

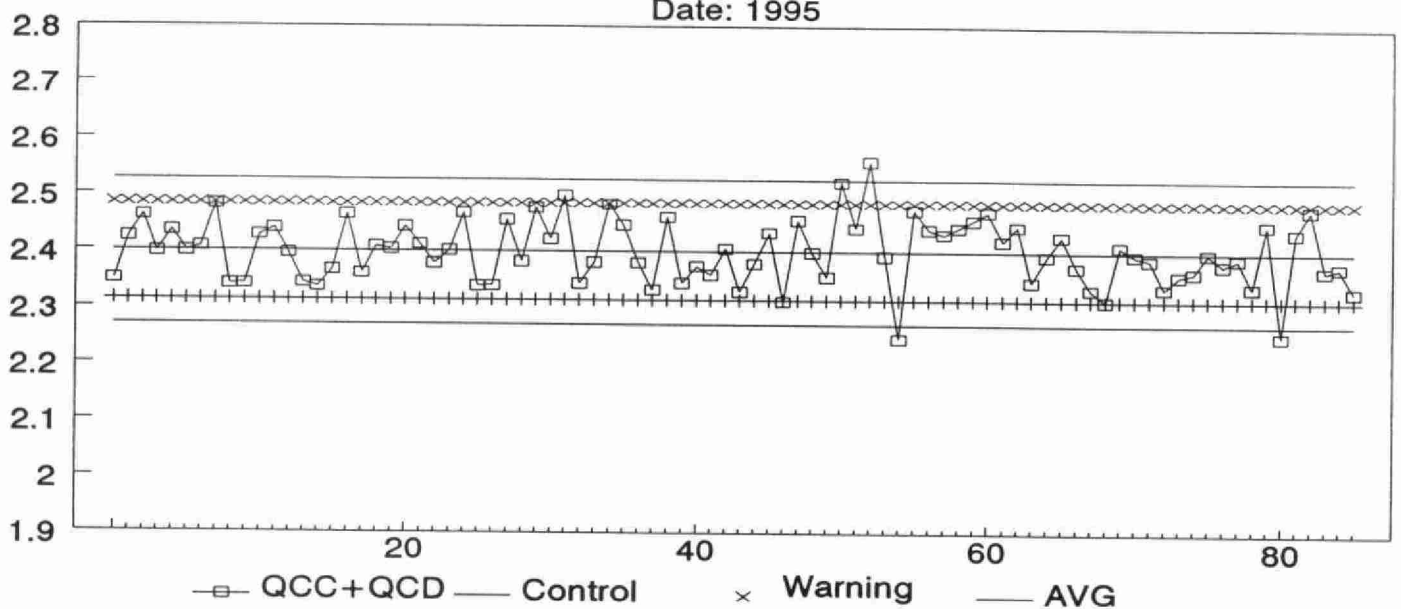
QC Difference Trades - Ni

Date: 1995



QC Sum Trades - Ni

Date: 1995



Strontium (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 2 - 10,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0227

Control Samples:

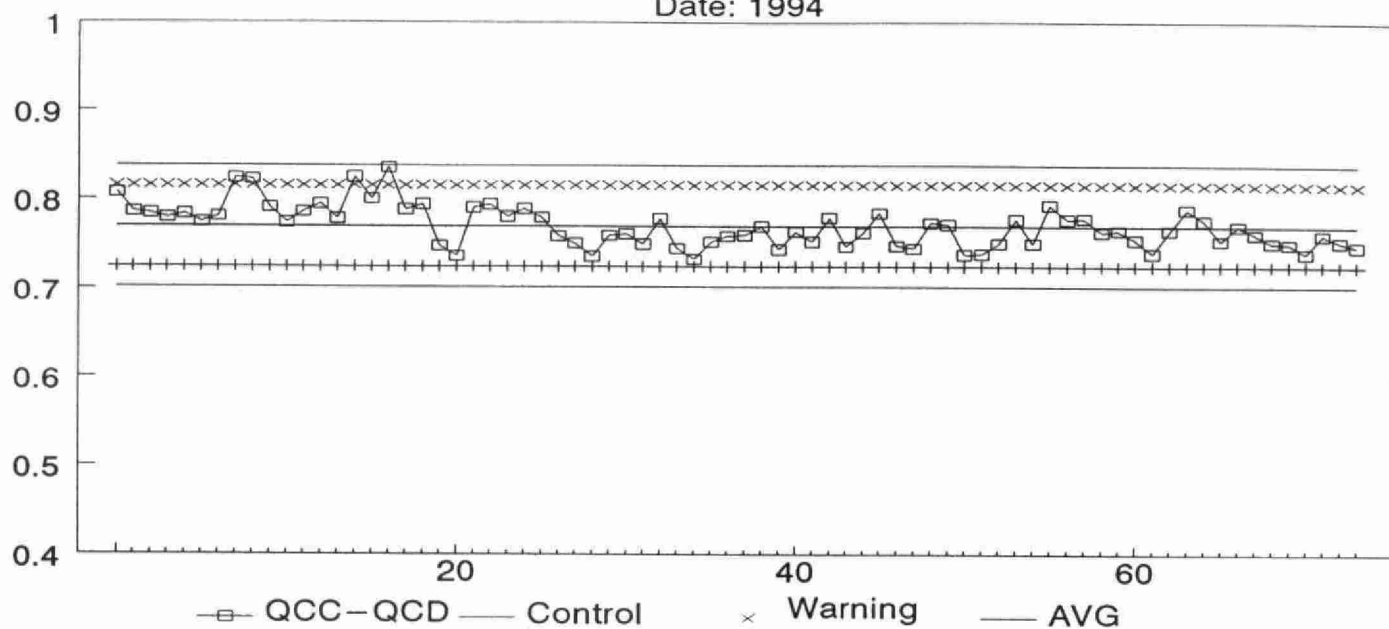
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	74	1.000	0.9591	-0.0409	0.0260
QCD:	74	0.200	0.1890	-0.0110	0.0058
QCC+QCD:	74	1.200	1.1480	-0.0520	0.0301
QCC-QCD:	74	0.800	0.7701	-0.0299	0.0227

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
49	2 - 200	73.00	1.20
19	200 - 2000	504	8.3
n/a	2000 - 10000	n/a	n/a

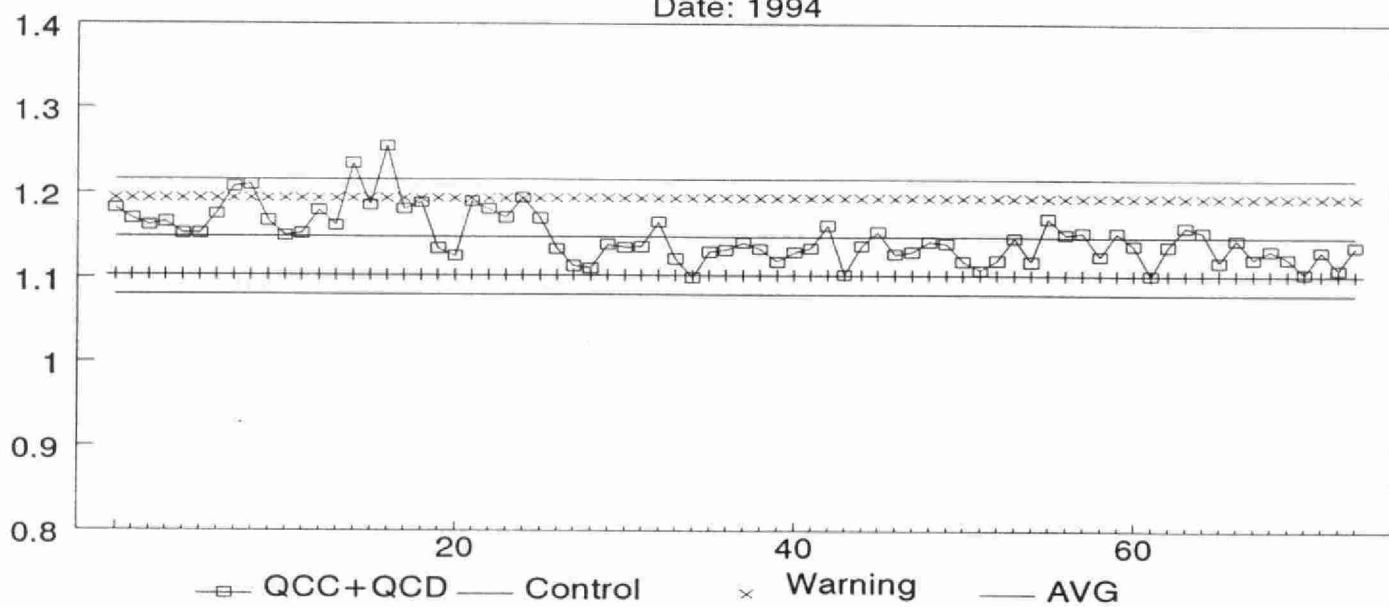
QC Difference Trades - Sr

Date: 1994



QC Sum Trades - Sr

Date: 1994



Strontium (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 2 - 10,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0224

Control Samples:

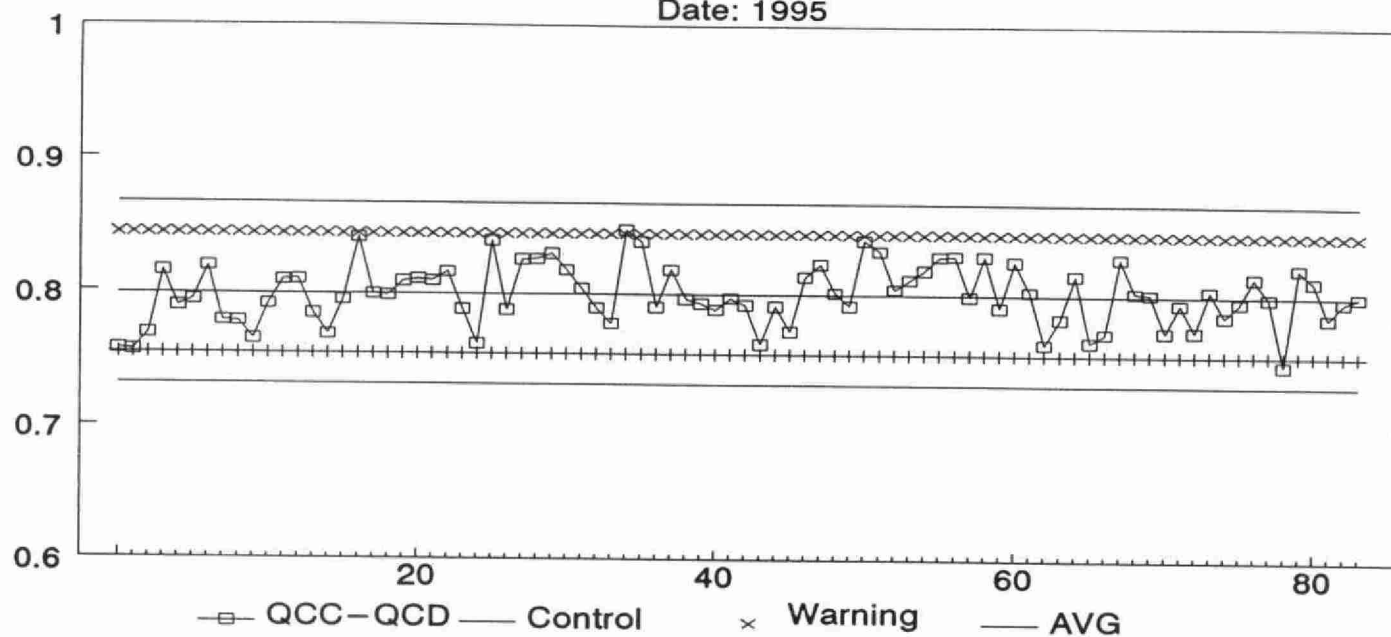
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	84	1.000	0.9936	-0.0064	0.0251
QCD:	84	0.200	0.1952	-0.0048	0.0048
QCC+QCD:	84	1.200	1.1888	-0.0112	0.0283
QCC-QCD:	84	0.800	0.7984	-0.0016	0.0224

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
56	2 - 200	62.00	1.30
21	200 - 2000	55	10.6
n/a	2000 - 10000	n/a	n/a

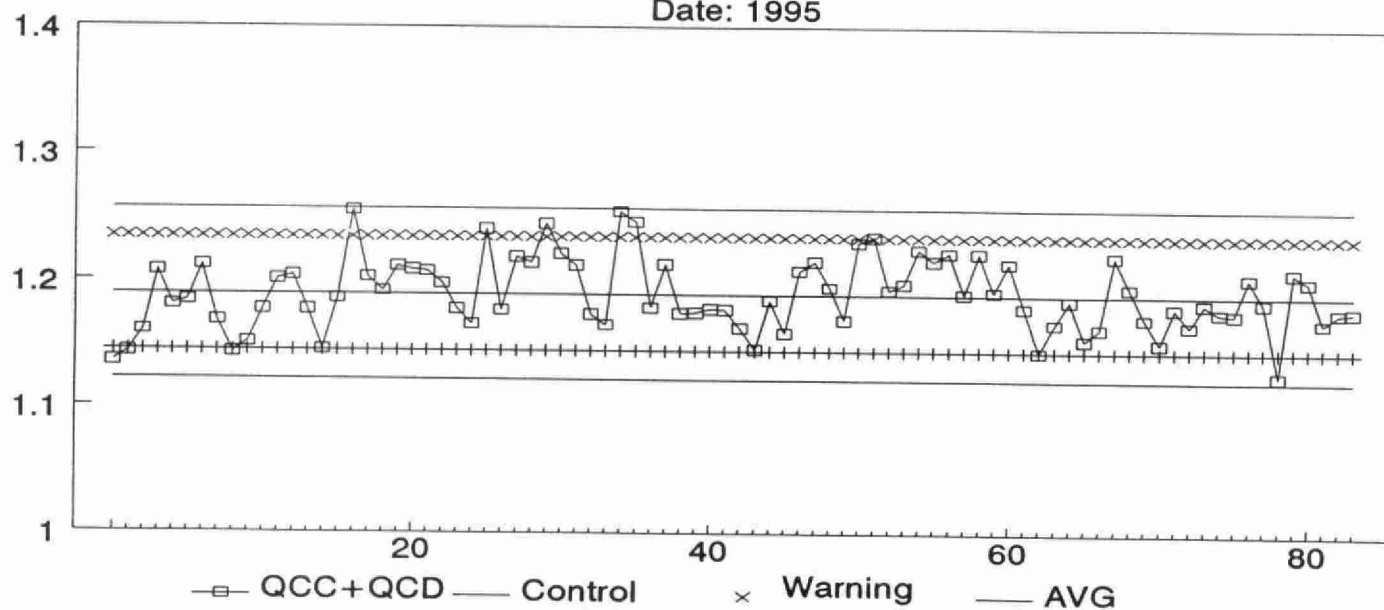
QC Difference Trades - Sr

Date: 1995



QC Sum Trades - Sr

Date: 1995



Titanium (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 5 - 15,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0391

Control Samples:

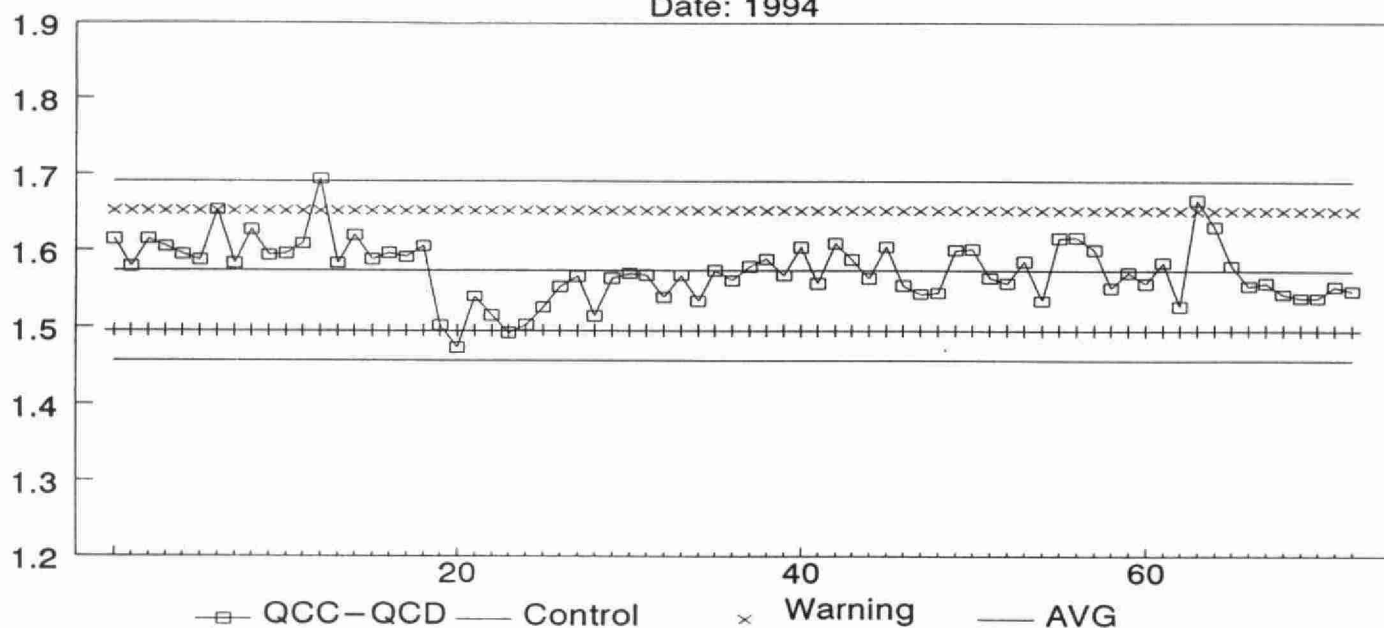
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	73	2.000	1.9582	-0.0418	0.0415
QCD:	73	0.400	0.3844	-0.0156	0.0090
QCC+QCD:	73	2.400	2.3426	-0.0574	0.0456
QCC-QCD:	73	1.600	1.5737	-0.0263	0.0391

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
58	5 - 500	18.00	1.60
n/a	500 - 5000	n/a	n/a
n/a	5000 - 15000	n/a	n/a

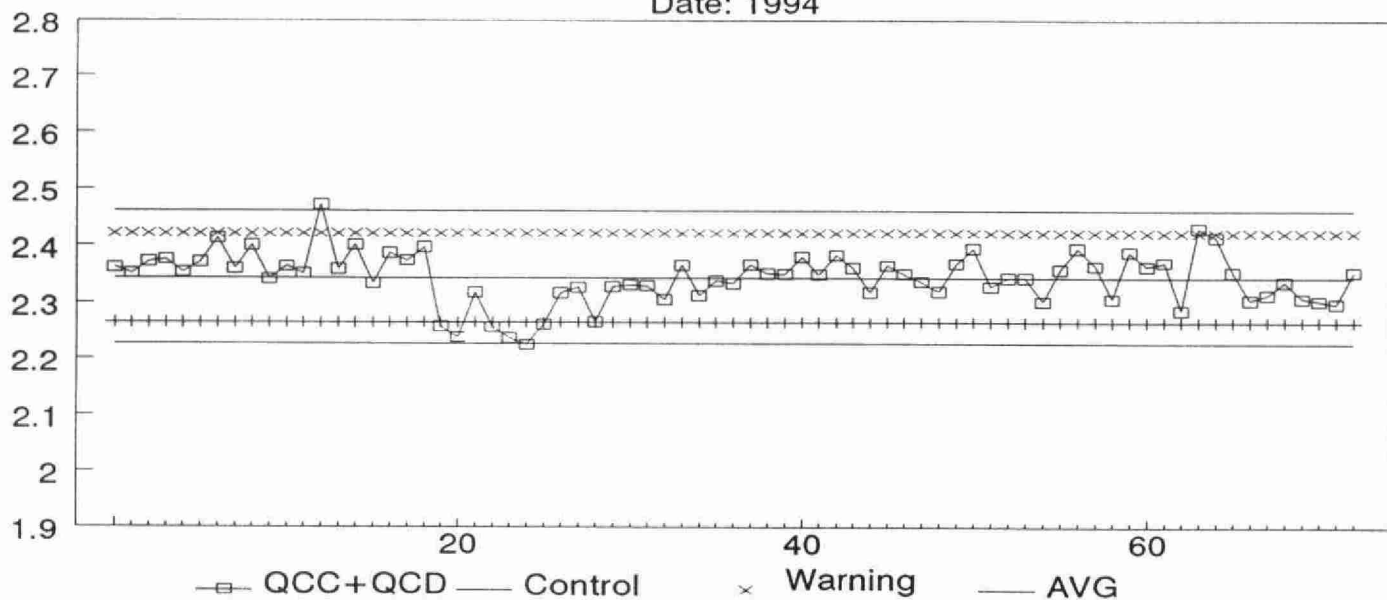
QC Difference Trades – Ti

Date: 1994



QC Sum Trades – Ti

Date: 1994



Titanium (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 5 - 15,000 ug/L

Detection Limit (W): 5 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0413

Control Samples:

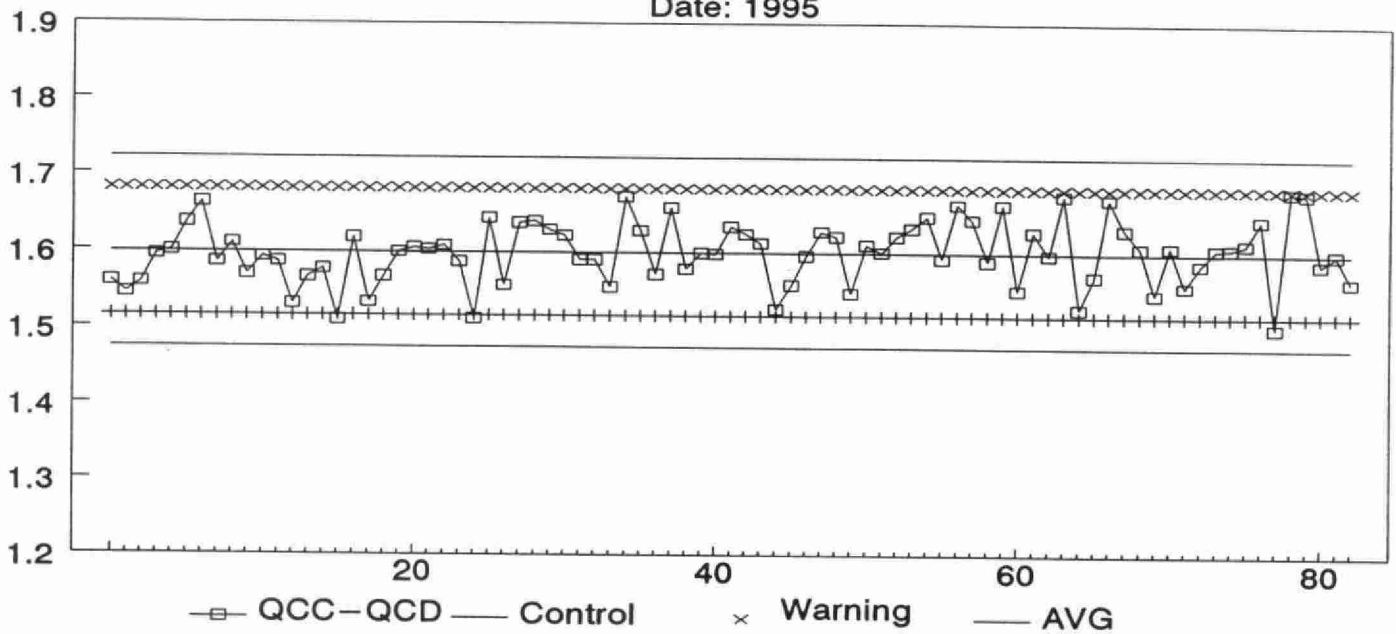
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	83	2.000	1.9863	-0.0137	0.0448
QCD:	83	0.400	0.3887	-0.0113	0.0076
QCC+QCD:	83	2.400	2.3750	-0.0250	0.0492
QCC-QCD:	83	1.600	1.5975	-0.0025	0.0413

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
79	5 - 500	5.10	1.20
n/a	500 - 5000	n/a	n/a
n/a	5000 - 15000	n/a	n/a

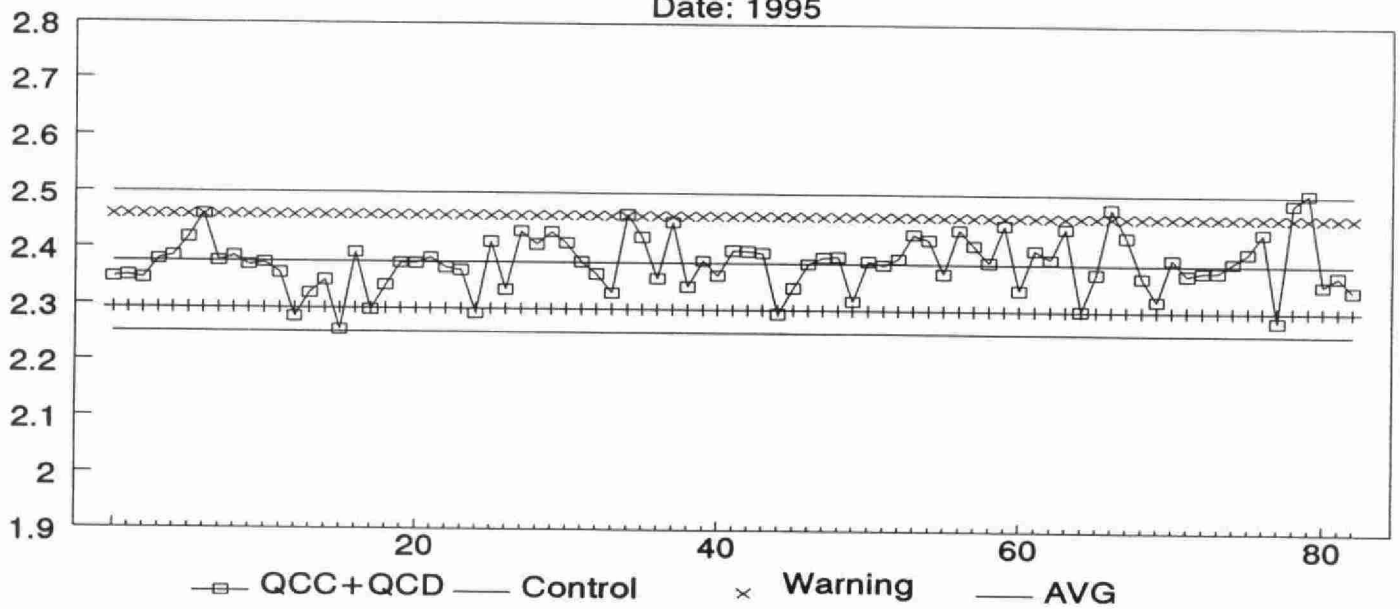
QC Difference Trades - Ti

Date: 1995



QC Sum Trades - Ti

Date: 1995



Vanadium (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 2 - 25,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0333

Control Samples:

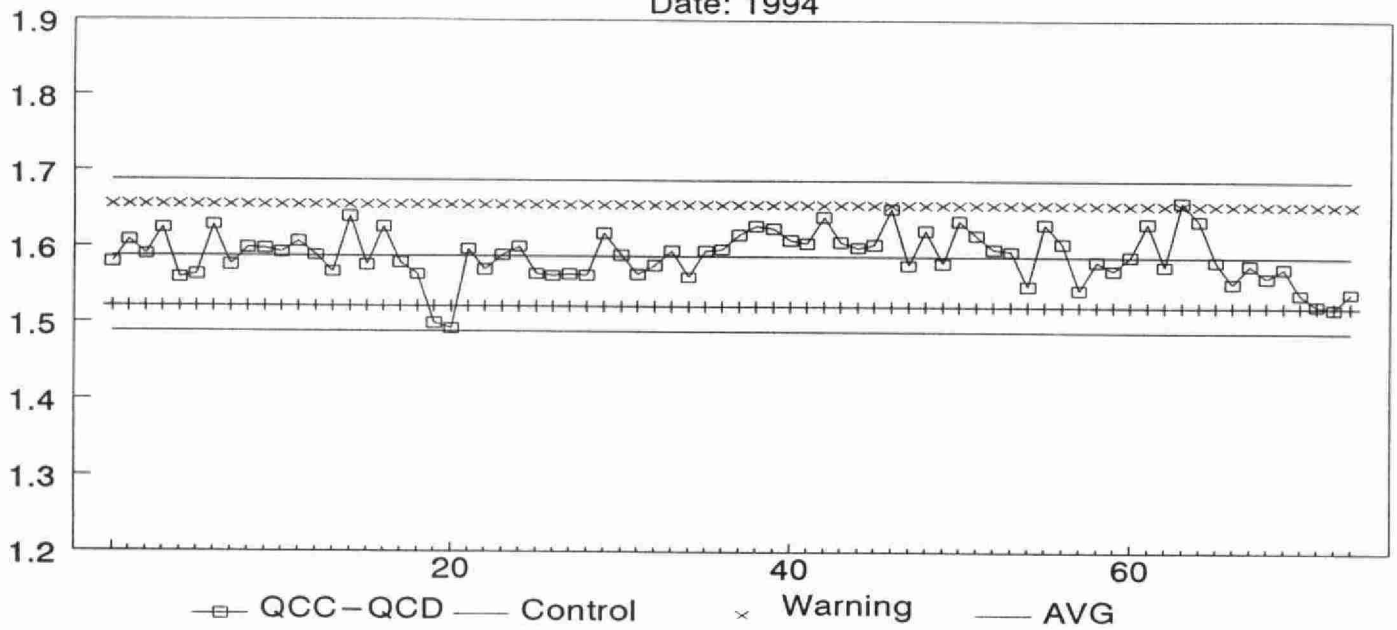
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	74	2.000	1.9762	-0.0238	0.0377
QCD:	74	0.400	0.3885	-0.0115	0.0107
QCC+QCD:	74	2.400	2.3647	-0.0353	0.0442
QCC-QCD:	74	1.600	1.5878	-0.0122	0.0333

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
69	2 - 200	7.10	1.30
n/a	200 - 2000	n/a	n/a
n/a	2000 - 20000	n/a	n/a

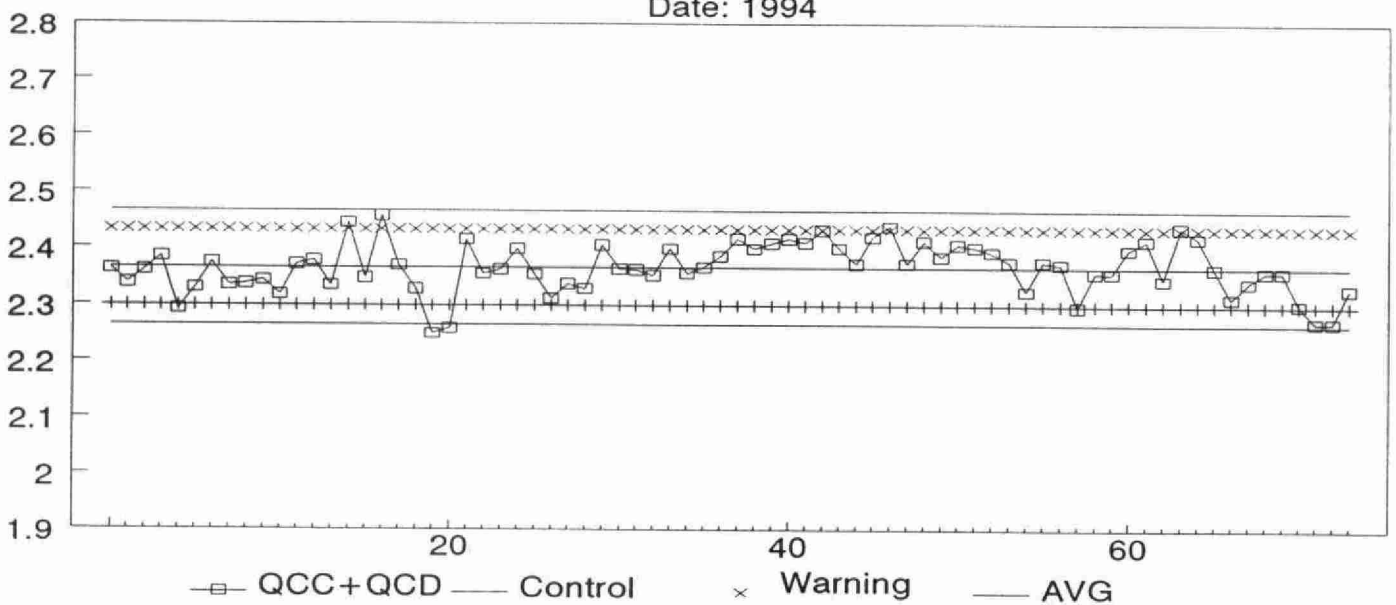
QC Difference Trades - V

Date: 1994



QC Sum Trades - V

Date: 1994



Vanadium (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 2 - 25,000 ug/L

Detection Limit (W): 2 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0392

Control Samples:

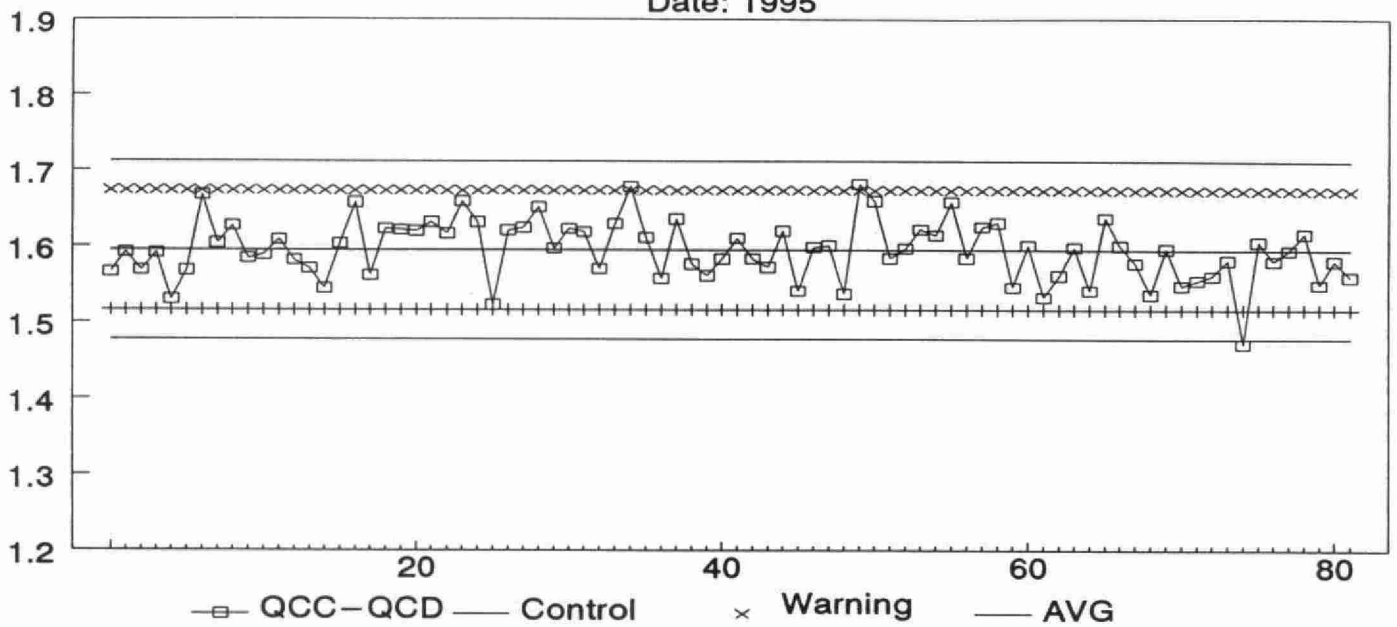
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	82	2.000	1.9844	-0.0156	0.0446
QCD:	82	0.400	0.3900	-0.0100	0.0097
QCC+QCD:	82	2.400	2.3744	-0.0256	0.0513
QCC-QCD:	82	1.600	1.5944	-0.0056	0.0392

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
79	2 - 200	5.80	0.96
n/a	200 - 2000	n/a	n/a
n/a	2000 - 20000	n/a	n/a

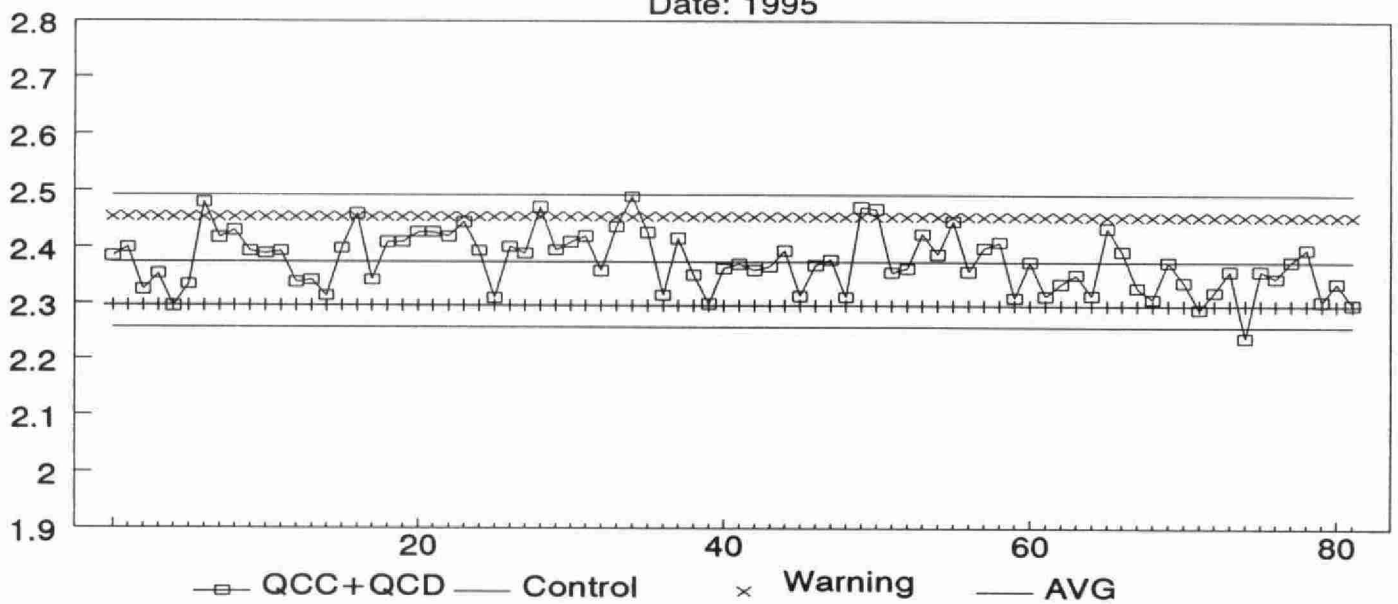
QC Difference Trades - V

Date: 1995



QC Sum Trades - V

Date: 1995



Yttrium (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 1 - 20,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0201

Control Samples:

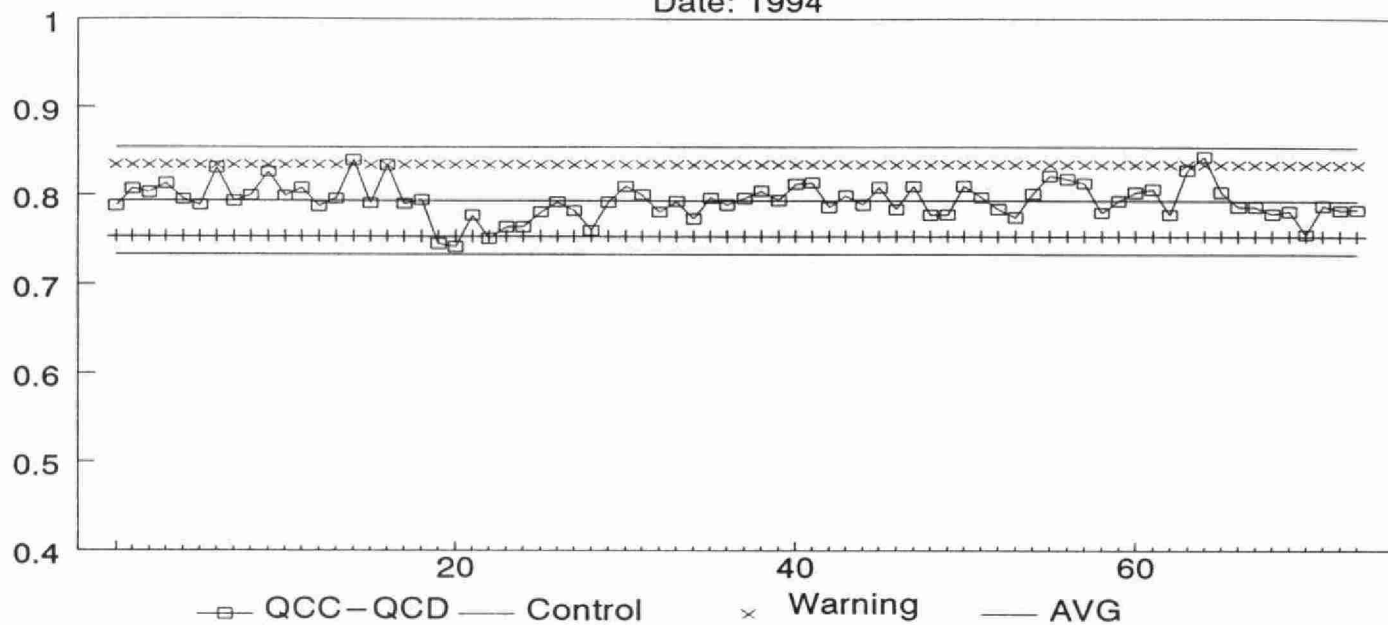
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	74	1.000	0.9894	-0.0106	0.0215
QCD:	74	0.200	0.1952	-0.0048	0.0041
QCC+QCD:	74	1.200	1.1846	-0.0154	0.0235
QCC-QCD:	74	0.800	0.7942	-0.0058	0.0201

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
68	1 - 100	1.90	0.39
n/a	100 - 1000	n/a	n/a
n/a	1000 - 10000	n/a	n/a

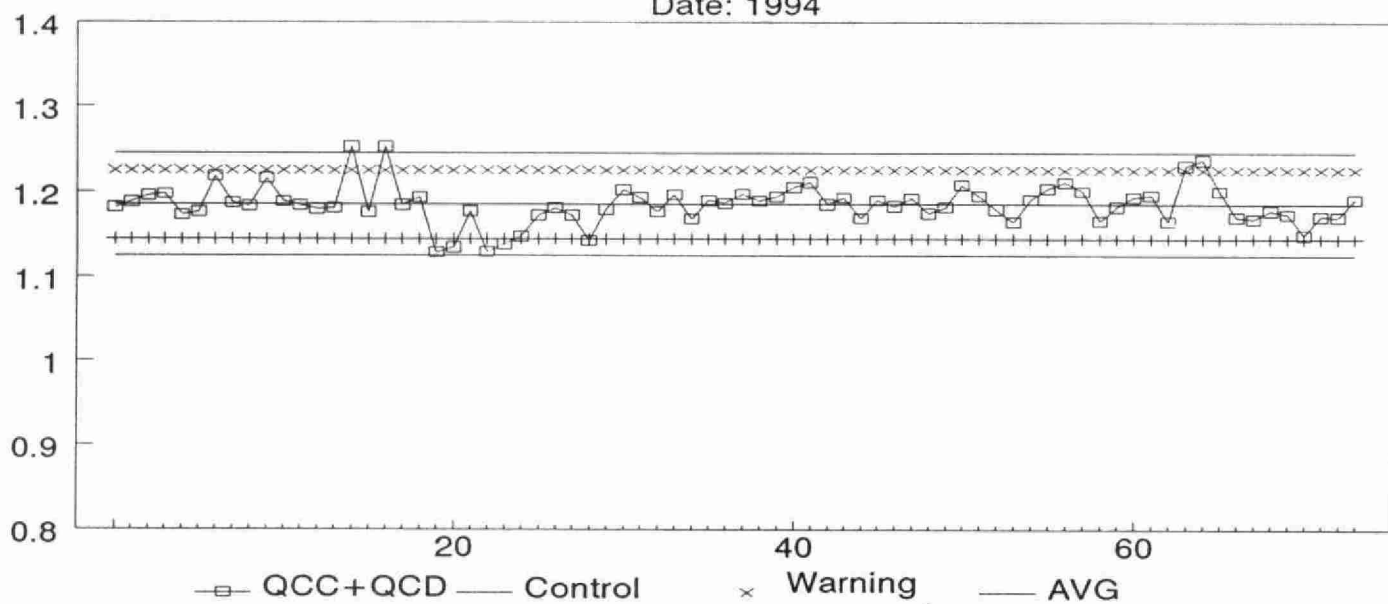
QC Difference Trades - Y

Date: 1994



QC Sum Trades - Y

Date: 1994



Yttrium (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 1 - 20,000 ug/L

Detection Limit (W): 1 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0201

Control Samples:

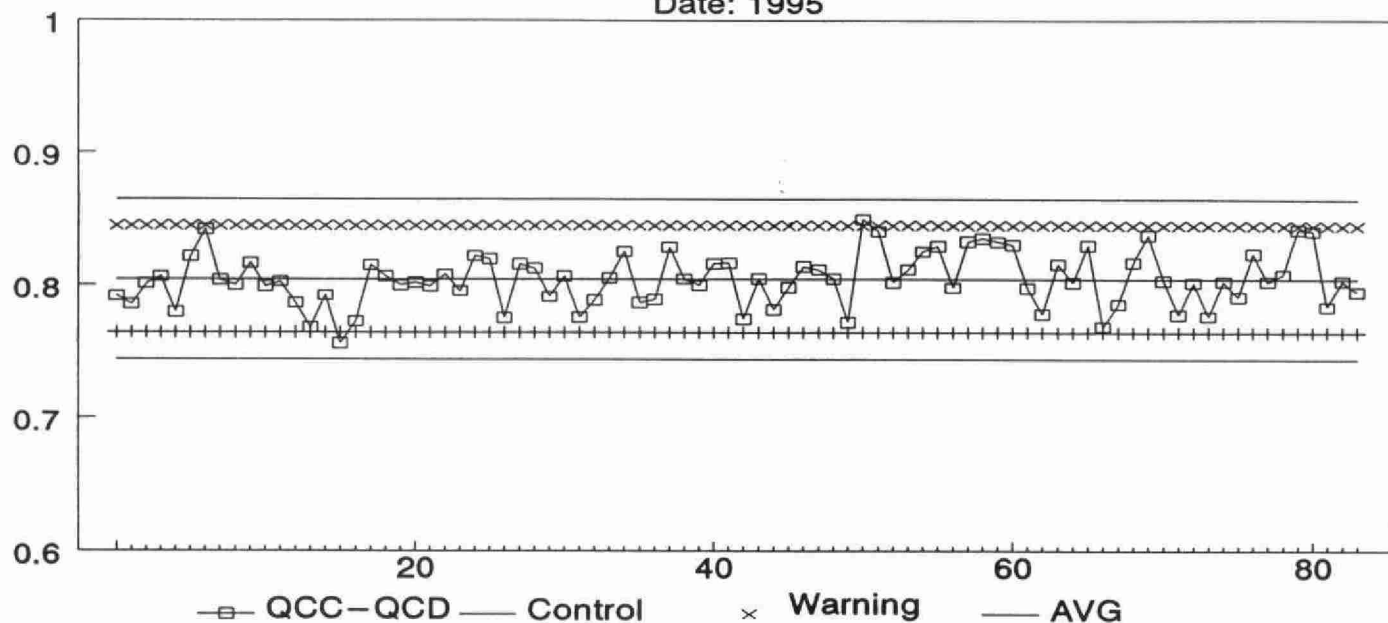
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	84	1.000	1.0006	0.0006	0.0223
QCD:	84	0.200	0.1961	-0.0039	0.0041
QCC+QCD:	84	1.200	1.1966	-0.0034	0.0251
QCC-QCD:	84	0.800	0.8045	0.0045	0.0201

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
83	1 - 100	1.27	0.58
n/a	100 - 1000	n/a	n/a
n/a	1000 - 10000	n/a	n/a

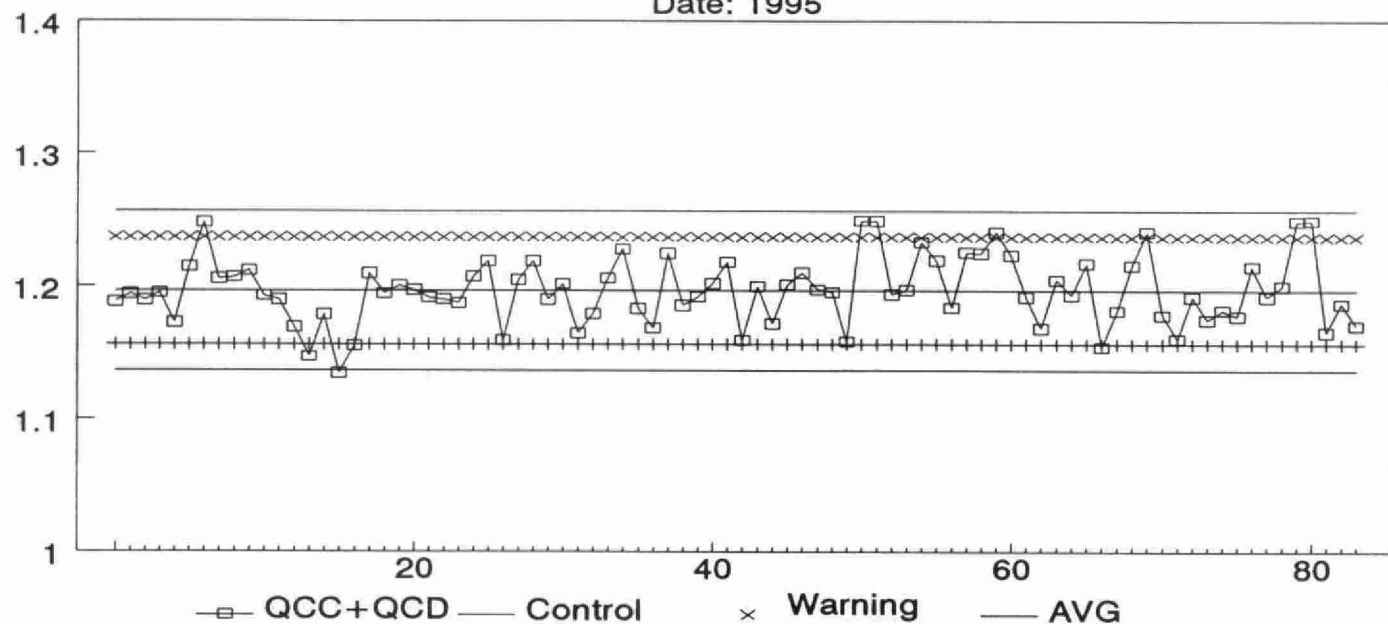
QC Difference Trades - Y

Date: 1995



QC Sum Plot Trades - Y

Date: 1995



Zinc (Total) - Trades

Quality Control Data from 940101 to 941231

Analytical Range: 10 - 15,000 ug/L

Detection Limit (W): 10 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0402

Control Samples:

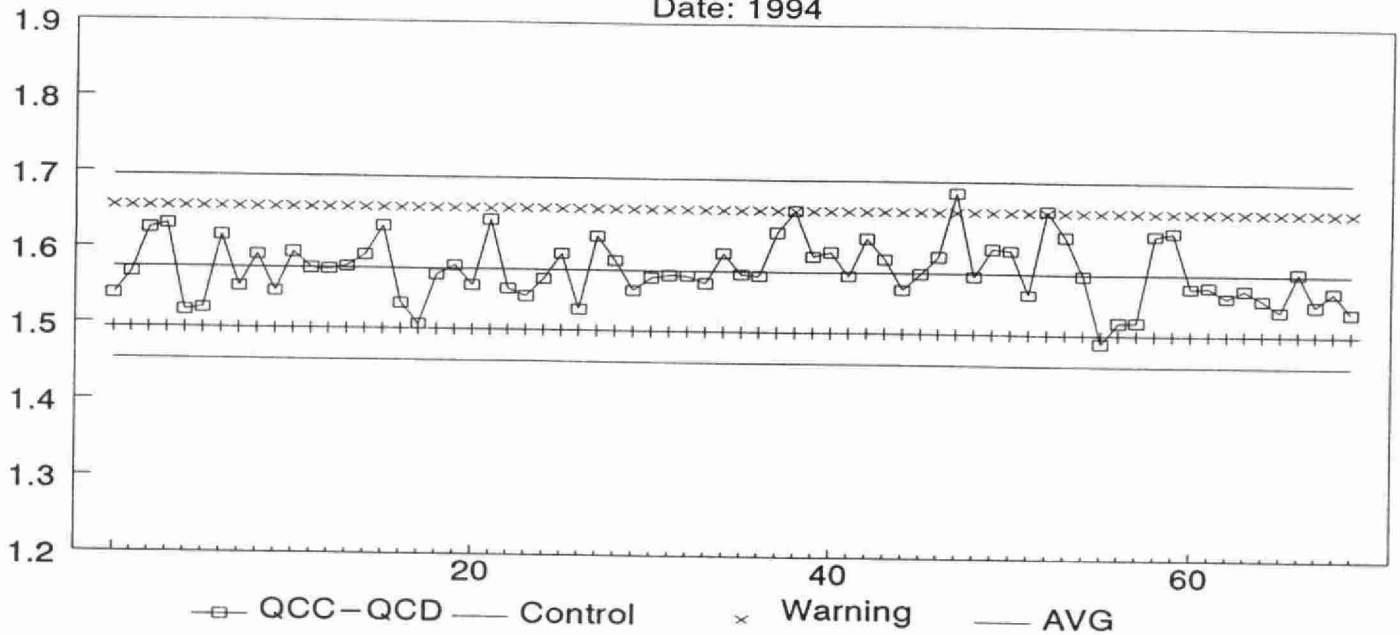
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	70	2.000	1.9585	-0.0415	0.0448
QCD:	70	0.400	0.3844	-0.0156	0.0117
QCC+QCD:	70	2.400	2.3428	-0.0572	0.0516
QCC-QCD:	70	1.600	1.5741	-0.0259	0.0402

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
58	10 - 1000	48.00	3.70
n/a	1000 - 10000	n/a	n/a
n/a	10000 - 15000	n/a	n/a

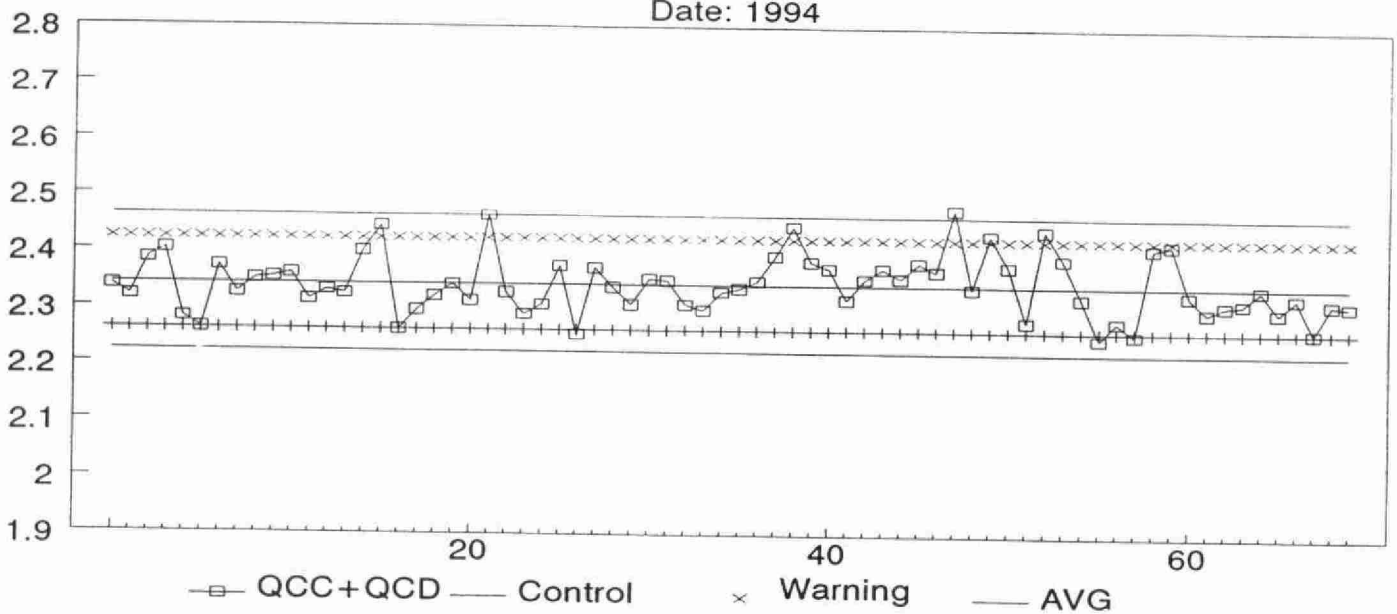
QC Difference Trades - Zn

Date: 1994



QC Sum Trades - 1994

Date: 1994



Zinc (Total) - Trades

Quality Control Data from 950101 to 951231

Analytical Range: 10 - 15,000 ug/L

Detection Limit (W): 10 ug/L

Sw used to calculate control limits -

Sw(C-D): 0.0413

Control Samples:

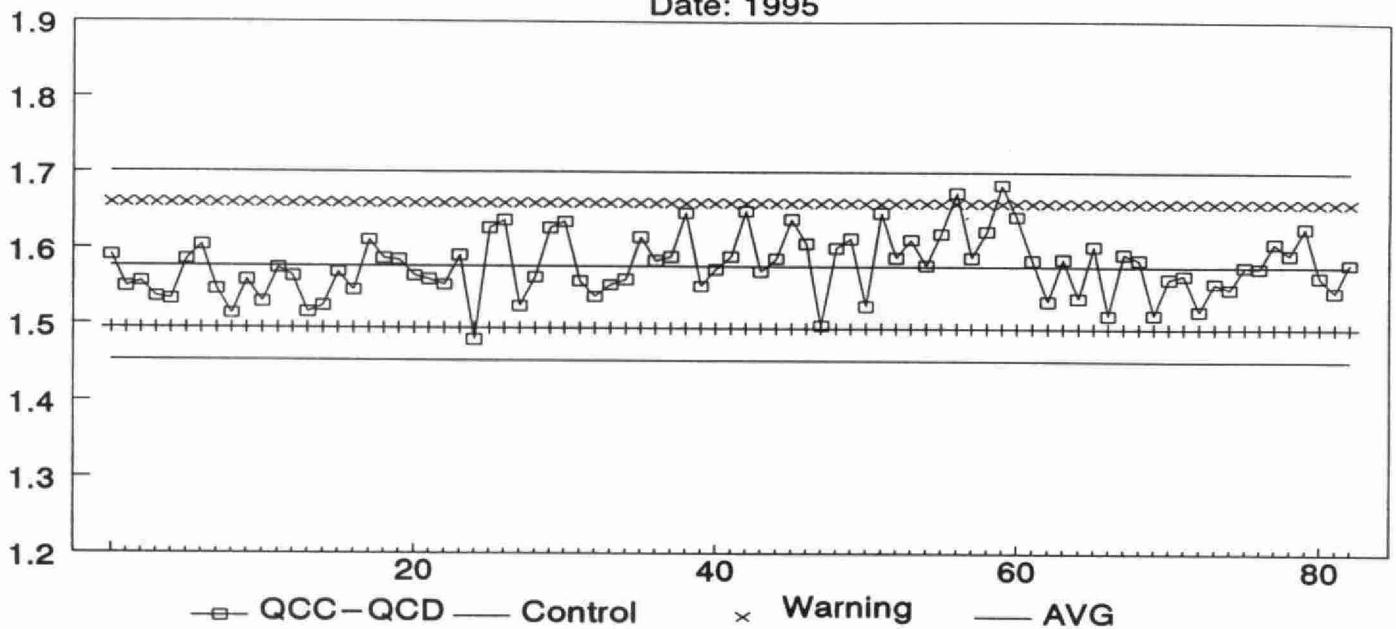
	Number of Data Points	Target Conc.	Avg. Conc. Measured	Average Bias	Standard Deviation
QCC:	83	2.000	1.9610	-0.0390	0.0461
QCD:	83	0.400	0.3842	-0.0158	0.0095
QCC+QCD:	83	2.400	2.3452	-0.0548	0.0521
QCC-QCD:	83	1.600	1.5768	-0.0232	0.0413

Duplicates:

Number of Data Pairs	Sample Conc Span	Mean Value	Standard Deviation
78	10 - 1000	34.00	2.30
n/a	1000 - 10000	n/a	n/a
n/a	10000 - 15000	n/a	n/a

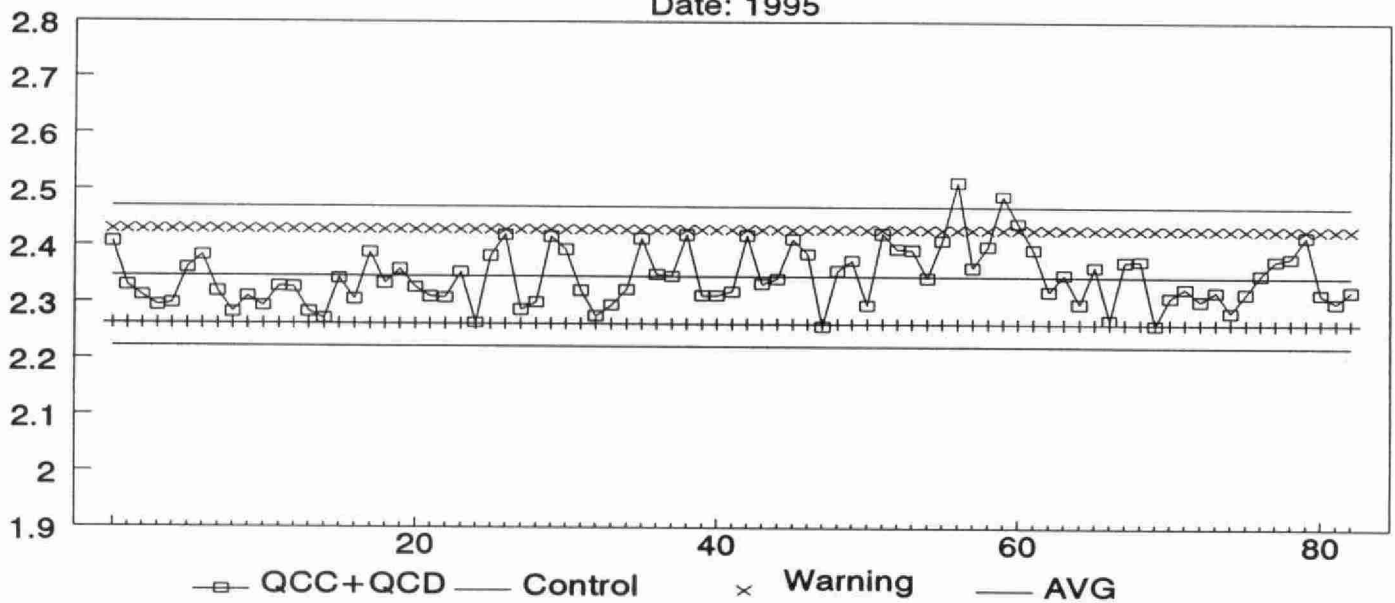
QC Difference Trades - Zn

Date: 1995



QC Sum Trades - Zn

Date: 1995





(8470)

TD/380/T86/1995/MOE